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# MECHANICS' MAGAZINE

AND

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THE

#### MECHANICS' MAGAZINE.

LONDON: THURSDAY, JANUARY 1, 1869.

THE PAST YEAR. GENERAL RETROSPECT.

N commencing our annual review of the occurrences which have marked the scientific progress of the past year, we are struck with the absence of any results which stand out more prominently than others, or of any circumstances that impart to the year just closed any special lustre. Progress there undoubtedly has been, but it has been slow; things have been going on very coberly and quietly, and although we looked forward this time last year with hope to a cessation of that stagnation under which trade and commerce had for long laboured, our hopes have not been realized. That engineering is still at a low ebb is a plain fact which cannot be dis-guised. But there are some signs of returning vitality at home amongst our manufacturing engineers, and abroad there appear to be works upon which we hope the new year may see some of our civil and mechanical engineers England, it would seem, has had a surfeit of railways, and for the present we cannot hope that much will be done to add to their mileage. But we look to the future for a further development of our railway system, as well as to an extension of our dock and port accommodation. In the meantime, there are unmistakeable signs of work abroad, especially in India, where greatly needed irrigation and storage works, on a gigantic scale, are proposed. Here, indeed, is a field for en-In Central India there are nearly 124,000,000 acres to be irrigated; in Hindostan 1,500,000 acres still crave water; in the Mysore district the old native structures are being disinterred with a view to their restoration to use; the flood canals in Scinde are to be converted into perennial streams; a tank, to cost £90,000, is among the works now going on in the Deccan; two canals leading to Calcutta are to be made-one from the coal mines of Raneegunge, the other from the Ganges at Rajmahal; another, from the Jumna, near Delhi, will water the Muttra and Agra dis-tricts; and the Sutlej Canal, first projected in 1861, is now to be put in hand. To these matters, then, we commend the attention of the engineering profession, and if it can only succeed in awaking the capitalist from out of his lethargy, it will reap a rich reward.

We have said that there was no startling circumstance or discovery to mark the year just past. True, there was not; but none can say how nearly there may have been in Captain Ericsson's wonderful solar engine, which under the head of "Bottled Sunshine," we discussed at page 321 of our last volume. The latest intelligence in this direction is, that M. Mouchat, who has been experimenting on the utilization of the solar heat, sent a paper on this subject to the Academy of Sciences. He states that, according to his experiments, upwards of three-sixths of the solar heat might be gathered at a small cost. At Paris, a surface of one square metre normally exposed to the rays of the sun receives, on an average, at any time of the year, on a fine day, ten units of caloric per minute. Such a quantity of heat would make a litre of water at freezing point boil in ten minutes, and is equivalent to the theoretical action of a one-horse power. He further states that he had proved the possibility of keeping hot-air machines a-going by means of solar rays, and had succeeded in making a few litres of water boil by exposure to the same agent; and in June, 1866, he had made a small steam engine work by convert-

June, 1869, that either Captain Ericsson or M. Mouchat will have succeeded in utilizing this power to some useful purpose, but we, nevertheless, do not expect it.

Proceeding to more practical matters, we may first refer to the establishment of works for making steel by the direct process discovered by Mr. Heaton. There has been much discussion upon the practical results of this invention, but its success is unquestionable, and we believe the introduction of the process marks an era in our steel manufacture, upon which Mr. Heaton is to be congratulated. The question of technical education has been prominently before the public during the past year, and has received an impetus in the benefaction of Mr. Whitworth, which will bring forth fruits for all time. Mr. Whitworth has done much to promote the engineering interests of the country, but this unselfish and noble-minded act places his professional achievements in the shade.

Metropolitan improvements have made considerable advance during the year. A magnificentmeat and poultry market has been recently opened; the Holborn Viaduct has progressed satisfactorily; the Thames Embankment has been opened to the public from Westminster to the Temple, and its continuation to Black-friars Bridge is progressing. An untoward accident, however, will retard the works on this section, the completion of which will, therefore, be delayed beyond the contemplated period. The new bridge at Blackfriars has for some time past presented a very forward appearance, the ribs being in place from end to end of the structure. Three of the arches have the spandrils filled in, and the parapets are fixed to two arches. The cross girders and roadway bearers are fixed over two of the arches ready to receive the buckle plates. We believe that if no accident arises to interfere with the works, this splendid bridge will be opened to the public in June next. land Railway terminus at St. Pancras, which is covered by the largest roof in the world, has been opened, and the public have the opportunity of inspecting one of the finest ieces of roof construction of the day.

From railway stations to railway trains is an easy transition, and here we have to notice the successful trial of several methods of communicating between passengers and guards in railway trains during the year. These have been based chiefly upon the electrical and the pneumatic principles. As the time approaches when such communication will be enforced by law, it behoves our railway officials to be up and doing, or they will find themselves unprepared to meet the requirements of an Act of Parliament by the time they are called upon to pay the penalties it exacts.

In gunnery matters we have to note the recent success of the Whitworth gun in accomplishing a range never before reached. Mr. Whitworth is to be congratulated upon this result, but we look for further experiments to test the penetrative powers of this weapon. The Millwall shield, designed by Mr. Hughes, of the Millwall Iron Works, nas most successfully borne the brunt of a heavy fire with Palliser shot, and has set us thinking what turn the question of guns v. targets will assume during the coming year. The commencement of last year found the guns-thanks to Major Palliser's chilled projectiles -victorious; the commencement of the present year finds the targets—thanks to Mr. construction and metal-in the ascendency. The Moncrieff system of serving guns in forts, and Captain Scott's method of training them on board ship, have been proved to be very successful, and to embody the principles demanded by the present positions of military and naval gunnery.
In small arms we have no actual result as

far as regards the definitive official adoption of any one system out of the many which entered into the Government competition. The Henry rifle undoubtedly carried off the ing water into vapour with the assistance of reflector one metre square. We hope by palm, but whether it will be finally adopted other than those to which we have been re-

as the military arm of the future appears at present uncertain. Unless a better system can be produced—and we doubt whether it can-it will be an act of injustice to Mr. Henry if his arm be not introduced into the The small-arm cartridge public service. question was settled by Mr. Daw receiving the £400 prize, but here the matter rests. We cannot, however, understand why, if this cartridge was acknowledged to be the best out, it should not supersede the present service cartridge. We, some months since, proved that it possessed qualities which rendered it superior to the service cartridge, and certainly expected the authorities, in the fulfilment of the trust reposed in them, would adopt into the national service the best cartridge they could find.

Gunpowder is so closely allied to gun cotton that we naturally turn from the one to the other. Here we find a marked improvement to have been introduced during the past year. This consists in rendering this dangerous material safe in case of accidental ignition in any other condition than that of actual use. By Professor Abel's pulping process, and a peculiar method of treatment introduced by Messrs. Prentice, this firm are now producing a material which will not explode except in a closely confined position. We recently burnt a large wad of this material on our hearth, which, if it had been made under the old system, or if it had been enclosed in a resisting material, would probably have re-moved ourselves and our office to another part of Fleet-street, and in a most summary manner. As it is, experiments with this gun cotton have so convinced railway managers of its safety that it is now carried on some lines at the ordinary goods tariff. While on this subject, we must not pass by Mr. Nobel's splendid improvements upon that frightfully dangerous compound—nitro-glycerine. What Mr. Abel has done for gun cotton, Mr. Nobel has effected for nitro-glycerine. He has, in effect, tamed it, and although the most startling results are produced from the new material—dynamite—when fired with a special fuse, when fired in the ordinary way it is as harmless as the same quantity of sawdust. Some advance has been made during the

past year towards solving the question of using petroleum as a fuel on board steam vessels. On land it has for some time past been in use under boilers, being burned in several different ways. But it remained for Mr. Dorsett to demonstrate the practicability of successfully working a ship of 500 tons burthen with mineral oil. Although the application was comparatively rude, and the apparatus capable of considerable improvement, the experimental trips with the "Retriever," a month or two since, left no doubt as to the efficiency of the system, and, taken all in all, it was the first success of the kind on such a scale—that we have had. Messrs. Wise, Field, and Aydon's system of burning liquid fuel is being adapted to a large vessel, and we hope soon to hear of some results. The application of gas to the generation of steam, upon Mr. Jackson's system, has been perfectly successful wherever it has been tried. Mr. Jackson, the successful exponent of this system, has put down several of his gas furnaces during the past year, and, judging from the favour they meet with, we doubt not but that he will put down many more in the year now before us. We have not remarked that any progress has been made during the past year in solving the question of peat fuel—that is, in producing it in such a form and at such a price as that it may become a staple commodity in the market. We have no doubt of its great value for many purposes, and trust its merits will not be lost sight of. A fortune lies before the man who successfully utilizes the enormous deposits of peat Great Britain and Ireland contain.

Whilst men have been working ferring. busily in the visible world, death has been busy too, and has removed some of them from amongst us to the invisible world. During the year just closed, there have passed away from us several distinguished labourers in the fields of science, and others who had carned for themselves a name by their pro-fessional prominence. Amongst the first of these stands Sir David Brewster, who died on the 10th of February last, at the ripe age of eighty-seven-"full of years and honours. On the 27th of the same month died Mr. Michael Lane, long connected with, and of late years the engineer-in-chief of, the Great Western Railway. Mr. Stewart, the chair-man of the Anglo-American Telegraph Com-pany, died a few days later. The 7th of May saw the close of the career of a great man-Henry Lord Brougham-who, during his life, often entered heartily into matters of science, and with whom one of the founders of the MECHANICS' MAGAZINE was associated in the establishment and promotion of mechanics' institutions. The 20th of November saw institutions. the death of Mr. John Robertson, the maker of the engines of the "Comet," the first vessel that steamed on the Clyde. The "Comet" was the first steamboat that plied on European rivers for practical purposes, and Mr. Robertson was the first engineer (out of America) who permanently succeeded in adapting steam to the propulsion of vessels on rivers for purposes of actual traffic. Our latest loss has been that of Mr. James Chalmers, a gentleman whose name is well known to our readers, and who died on Saturday last. Mr. Chalmers was the inventor of the target which bears his name, and the projector of the Channel railway to connect the shores of England and France. It will be remembered that some of the experiments at Shoeburyness proved that the guns had obtained a victory over Mr. Chalmers' target. As, however, Mr. Chalmers had improved his system, so as to meet the requirements of the times, a second target was ordered by the authorities, and is just ready for further experiments. We regret to find that Mr. periments. We regret to find that Mr. Chalmers leaves a widow and family in straitened circumstances, and we hope the Government will make them some acknowledgment of Mr. Chalmers' efforts to serve his country.

And now, having touched generally upon

those matters which have come with more or less prominence before our readers within the last twelve months, we shall proceed to notice, at greater length and under distinct heads, such special subjects as have been more fruitful of results than the majority of those we have been discussing. And first we shall refer to-

#### NAVAL ARCHITECTURE.

THE shipbuilding of the year has not been remarkable in so far as mercantile steam vessels are concerned, unless the losses of the "Hibernia," the "Borderer," the "Gossamer," and other vessels, with their various degrees of horror, may be considered to give the subject a tragic interest. It is much to be feared that the keen competition of the Clyde and Tyne builders is leading to the increased production of cheap ships under lax conditions, and it will no doubt become a serious question ere long as to how far the Board of Trade is fulfilling its duties. We think there is ground to apprehend that the superthat department of the Government is gradually being narrowed down to a mere inspection of outfit, and that with the abandonment of the former requirements, in reference to water-tight bulkheads, other important structural considerations have been also abandoned. It cannot be denied that many iron ships are now built with nothing but a thin, and often bad, shell of iron to keep the passengers and cargo afloat, the collision bulkhead forward being all that is attempted in the way of water-tight subdivision of the expect to be in possession of full and authentic to the Government. This change has been interior. Mr. John Bright, M.P., the new information respecting the merits of all the throughout advocated by us, and we still feel

President of the Board of Trade, while shrinking from the control of the military of India, would certainly do well to turn his attention to the question which we have felt it our duty to raise here, and to see if he cannot prevent a portion of that annual loss of life and property which is brought about by imperfections in our ships. It is a task well worthy the efforts of a humane statesman.

One of the most striking facts in connection with the mail ships of the highest class is, that the Clyde has at length drawn the work of the Peninsular and Oriental Company away from the Thames, and in yielding to this the company have secured, we believe, both better and cheaper ships—better, not in point of workmanship or material, but of design, and in particular in the power of carrying their ports and side-lights well above the sea. The "Bangalore" and "Sumatra," both built by Denny, of Dumbarton, were great improve-ments upon the later Thames-built ships in this respect, the Thames firms having unquestionably run into extremely fine hatchet ends without compensating fulness at the middle body. The "Deccan," the last of these fine vessels built by Denny for the Peninsular and Oriental Company, is probably the very best ship in their fleet.

The nearest approaches to ships of the passenger-carrying class of mercantile steamers among the ships of the Royal Navy are the Indian transports, which are now performing their second season's work. In so far as the ships themselves are concerned, they are universally admitted to be the most efficient and commodious ships afloat; but the same praise cannot be given to their engines, of which those made for the "Jumna" by Maudslay and Field, and those for the "Scrapis" and "Crocodile," by Humphrys and Tennant, have proved the least satisfactory. be borne in mind, however, that the service required of these engines is very continuous and very trying for several months of the year together, and it appears to us more than probable that the engineer staff of these vessels is insufficient for the proper working of such complicated machines as the modern type of engines, working at high velocities for long

The war shipbuilding operations of the country have been remarkable during the past year. Messrs. Napier, of the Clyde, and Messrs. Laird, of the Mersey, have sent their Dutch monitors to sea, or, rather, have sent them home to Holland successfully; and Messrs. Napier's ram, "De Buffel," has likewise been completed and sent away, and availed herself of an early opportunity of proving that she, at least, although a turret ship, could roll as effectually as any broadside ship in the world. The turret ships "Capship in the world. The turret ships "Captain" and "Monarch" are approaching completion; so also is the monitor "Cerberus." The fast-flying frigate, "Inconstant," and the fast-flying corvettes "Volage" and "Active," will all be ready in the spring; and the pon-derous armour-clad "Hercules," with her with her extremely thick armour and 18-ton broadside guns, has had her bottom finally coated at Portsmouth, preparatory to her measured mile trials, after which she will forthwith proceed to test her qualities at sea. dacious" is to be launched a few weeks hence, and will at once be engined and completed, so that she may be got to sea in the course of a few months. This year will therefore be a most fruitful and interesting period of naval experience, Captain Coles sending forth his type and exemplar of a perfect sea-going turret ship, and Mr. Reed, the Chief Constructor, sending out not only a specimen sca-going turret ship, but also a specimen coast monitor, a specimen ironclad broadside frigate of the most powerful class, a specimen unarmoured frigate of extreme fleetness, and a specimen unarmoured corvette of like character. By the end of this year, therefore, we may fairly

leading types of modern war ships, and when the estimates of 1870-71 are prepared, Mr. Childers will have much ampler knowledge to proceed upon than any of his predecessors have possessed, or than he himself now has to guide him in preparing the work of next year.

The publication of a technical work upon iron shipbuilding, by the Chief Constructor of the Royal Navy, is a circumstance deserving mention here. Our review of this work, published in two successive numbers a few weeks ago, precludes the necessity for present comment; but it will be interesting to our shipbuilding readers to learn that this work has already been widely purchased in France, Prussia, Russia, Italy, and America, and proposals for its translation, in extenso, into the French and Russian languages have been made to the English publishers. The reception of the work by the profession in this country has been all that we predicted.

#### ELECTRICITY AND TELEGRAPHY.

In our remarks at the beginning of the year, we looked forward with some hope to greater telegraphic extension as a consequence of the renewed confidence in financial matters, and it is a matter of great congratulation that our hopes have been more than fulfilled. In telegraphy itself, many great and useful enterprises can be welcomed as not only undertaken, but carried out, during the past year, but also others which have been undertaken and are still in progress. Amongst the latter, is one which naturally claims our foremost attention, although, in our last summary, we looked forward to it as being one of the successes of the past year. It cannot yet be ranked as such, but it remains for the year ranked as such, but it remains for the year 1869 to complete the good already done. The acquisition of the electric telegraphs of the United Kingdom by the Government, and their being placed under the Post-Office administration, is alluded to. The question is one that had been mooted for some time, but, in the present spring, action began to be taken and enquiries made; the result has been a large correspondence and crossfire of pamphlets between Mr. Scudamore, of the Post-Office, on the one hand, and telegraph companies on the other. This cleared the way for the Government Bill, which, after being committed, and much time spent in discussing and amending its objects, finally passed both Houses of Parliament, and became law. empowered the Post-Office to buy up all the telegraph systems of the various telegraph companies of this country who were willing to sell their property. This all have been to sell their property. This all have been found willing to do, and meetings have been held authorizing the directors to agree to the Post-Office terms, which have been usually a twenty years' purchase on present rates. The final amount to be paid to the various telegraph companies has to be settled by arbitra-Agreements have also been entered into between the Postmaster-General and the various railway companies, by the which it is settled that all wires belonging to the railway company, and used by them for their special services of train signalling or otherwise, shall remain theirs, in addition to which the railway company will in future maintain all wires, poles, and telegraphs, the property of the Government, passing over their lines. Under this arrangement, there may be perceived the following curious change-what the telegraph companies formerly did and still do for the railway companies the railway companies will now do for the Government.

The Post-Office are making great internal changes preparatory to taking charge of the telegraph system, and to complete the transfer it is now only necessary to bring into l'arliament the bill for providing the necessary funds. It is anticipated that this will be done very early in the year, and by July 1 it is most probable that the various telegraph companies will have handed their systems over confident that the change will be beneficial to the general community.

The electric and telegraphic world has had a great compliment paid to them during the year by the knighting of Professor Wheat-stone. There are few men who have done, and who are still doing, so much good for telegraphy, and it is to be hoped that Sir Charles Wheatstone may live long and add more to his numerous inventions for improv-

ing telegraphy.

The French Atlantic cable is one of the enterprises of the year undertaken but not completed. Our columns lately have given completed. details of this work; suffice it to say that, by this time, about 700 miles of the deep sea cable are completed, and the shallow water cable and the heavy shore ends have been commenced. The work of fitting up the "Great Eastern" is satisfactorily going on, and early in January the first shipment of cable will take place. In fact, everything promises to be so forward and in such a completed state, that the "Great Eastern" will be able to leave our shores by July 1 next. It is to be trusted that, soon after that date, we shall possess another link in the chain to bind us to our transatlantic brethren.

Another important enterprise commenced and not completed during the year is the new Indo-European line. The object of this line is to carry two overground wires from Nordeney, on the Hanoverian coast, through Prussia, Russia, via the Black Sea, and through Persia to Teheran, where it will join the existing system belonging to our Government. From Nordeney to Lowestoft, wires are leased in the cable belonging to Reuter's Telegram Company, and from Lowestoft to London by the Electric Telegraph Company's system The whole scheme has been started from valuable concessions obtained from the various Governments by the Messrs. Siemens, who have surrendered their rights to a company called the Indo-European Telegraph Company. The entire works are being carried out by the Messrs. Siemens, and it is confidently anticipated that the whole system will be in working order towards the close of this year; this will then furnish us with another route to India.

A long step in the direction of another route to India has been undertaken and completed during the past year by the Anglo-Mediterranean Company, which was formed for the purpose of purchasing the line constructed by the Telegraph Construction and Maintenance Company from Susa, on the French-Italian frontier, to Modica, in Sicily, and for laying from Malta to Alexandria a direct deep sea cable. The whole of this work has been completed, and the line is now in perfect working order. The land line has been completed and handed over, a submarine The land line has cable laid across the Straits of Messina, and the deep sea cable of about 920 miles successfully submerged by Sir Samuel Canning between Malta and Alexandria. The submergence of this cable lasted some little time longer than usual, in consequence of two accidents happening during the paying out. A foul-flake occurred, when a quantity of cable was brought up in a bunch, but by quickly stopping the vessel, the mass was disentangled; and the vessel proceeded on her course until a kink occurred some time after; this unfortunately, however, gave rise to a slight fault. The vessel was stopped, and the cable picked up, the bad place was cut out, and the cable spliced, and all proceeded satisfactorily to the landing of the end. This cable is worked in a manner similar to the Atlantic, by the use of Thomson's reflecting galvanometers.

A cable of 340 miles in length was laid during the year by Messrs. Newall and Co., from Sondervig, on the Danish coast, to Newbiggen, near Newcastle, for the Danish, Nor-wegian, and English Telegraph Company. The special feature of this cable was the substitution of Hooper's india-rubber for gutta-

percha as the insulator. The cable works in

the most satisfactory manner.

We have yet a great many things to notice under this head, but want of space obliges us to defer the remainder of our remarks until next week.

#### ELECTRO- METALLURGY.

In the year that is just ended but little has been added to our knowledge of the laws of the electro-deposition of metals, and not a great deal to the application of those laws which are already known to the arts of electrocasting or electro-coating; still, some progress has been made, and especially in the improvement of some of the modes of carrying out these arts. Last year we noticed a new application of electro-coppering, as applied to the coating of ships for the pre-vention of fouling and corrosion, which had then but newly been tried, and we were then in hopes that by its means copper would soon be successfully applied to the bottoms of ships for their protection, but yet little progress has been made in that direction. that a firmly-adhering coating of copper cannot be applied to iron; we have seen this done repeatedly, but the difficulty is in applying it to ships. As we have pointed out repeatedly, this cannot be done to ships' plates before being built into the ship; there are the rivets, which must be coppered also—yet, if coppered, how are they to be riveted? It is impossible. Even if ordinary copper rivets were admissible on the score of cost and strength, they could not on the score of electric action. For if they contained lead, as almost all commercial copper does, they would become electro-negative to the electro-plastic copper, and so assist to destroy the coating of the plates. It is true that electro-plastic copper could be made into rivets, but this would be at double the cost at least, and this would enhance the price enormously, the rivets required being both very large and numerous. But besides these considerations. copper rivets would not be strong enough. Are we, then, to give up all hope of coating iron ships with copper? By no means; but it will not be by the direct application of the copper to the iron. We think the difficulties of such a process are too great to be successfully overcome. The process which appears to us most likely to succeed, is to coat the plates of iron with copper by electrolysis (the iron giving strength), and with these plates to sheath the bottom of the ship, between the sheathing and the ship an insulating substance being interposed. Of course, in this way, a ship could be sheathed with ordinary commercial copper, but the sheets would have to be of sufficient thickness to prevent buckling and bulging from the insulating material, so that with plates wholly of copper the sheathing would be six or eight times the cost of that we have hinted at. We should like to see thin iron plates coated with copper, applied as sheathing on a large scale. have seen it tried on a small one, and have but little doubt of its success on the large.

In electro-casting in copper there is nothing new to take note of; indeed, there seems scarcely anything to be desired in the results already obtained. In electro-coating with already obtained. In electro-coating with silver, as applied to copper, brass, and German silver, there is nothing new; but we are sorry to find that there is something new with regard to the coating of the alloy of lead and tin (common soft solder) with silver. Not that this practice has originated within the last twelve months, but it has become much more extended, to the loss of purchasers of plated spoons and forks. This is a deception and a cheat. The forks and spoons are roughly made of a common kind of German silver, or, rather, a highly speltered brass, without a particle of nickel in it, and then coated with common solder by immersion in the melted metal; they are then easily rubbed down smooth, and the expense of filing, 500deg. Fah., so as to fix the silver, and burnishing, and polishing saved, and this is after that it will stand a red heat without

the reason why this practice has been resorted There certainly is more difficulty to the ordinary practitioner in coating this alloy with silver than in coating German silver, The same method cannot brass, or copper. be pursued with this alloy as with the above metals. Mercurial cyanide or nitrate is of no avail to prepare it for the silver; instead of this as a preparation, the spoons or forks are suspended in a boiling solution of caustic potash or soda for a short time, and then transferred quickly to the silver cyanide solution, to which is attached a strong battery, so that they may be quickly coated with silver, and the action of the cyanide solution on the alloy is prevented by rendering it strongly negative. When they are coated they look as well as other spoons and forks, but they soon chip, owing to the softness of the alloy under the silver, as well as the imperfect adhesion of the silver to the alloy. This is a disreputable practice, because the inferior article cannot be known from the superior, except in the wear, when it is too late. We are sorry that it has much increased of late.

There is another branch of electro-coating, wherein some progress has been made during the past year, that is the coating of iron, steel, and cast iron with copper and silver. make silver to adhere firmly to iron and steel has been a desideratum much sought after for many years; indeed, ever since electro-plating was discovered. It has always been found much less difficult to make copper adhere to iron than to make silver adhere to it; consequently, it has hitherto been the practice to coat common dessert knives and nutcracks with a thin coat of copper and then with a coating of silver. But these are much inferior to the solder-plated knives, called close plated, which is a thin sheet of silver soldered on to the blade with common solder. These are called the best plated knives, though plated with soft solder, because hard or silver solder is not applicable to plating knife blades, on account of the heat necessary, but to carriage harness and coach fittings hard solder plating is applicable, but its expense prevents it being much used. This new process referred to above is equal to hard solder plating, but cheaper than soft solder plating. The inventor of it calls it pyro-plating, because the fixing of the silver is done by heat, as also the preparation of the articles for silvering. We noticed the first approach to this process some four years ago, when a patent was taken by the inventor, Mr. J. Baynes Thompson. In the specification of that patent is described the process for obtaining a pure surface, whereon to deposit the silver, and this was by depositing a film of iron on the article. But within the last six months the same gentleman has taken out another patent and abandoned the previous one. In this new process there is no intermediate coating of any other metal, the silver being deposited direct on the iron or steel. The surface of the iron is purified by nascent hydrogen, the hydrogen being produced by the electrolysis of hydrate of potash or soda; the inventor prefers hydrate of soda. With care, inventor prefers hydrate of soda. no other salt need be added to this solution, but in manufacture such care can hardly be expected; therefore, it is expedient to add a small quantity of one of the compound cyanides: those preferred are the nickelo or The necessity cobalti-cyanides of potass. for these salts is this :- If care be not taken to regulate the current of electricity according to the strength of the solution and the number of articles in it, as well as the heat of the solution, sodium will be deposited on the articles as well as hydrogen, and if transferred to the silver solution with that on, the silver will not adhere. The compound cyanide

prevents that. When the article is coated with silver it is subjected to a heat of between 400deg. and injuring the coating. Knife blades and all cutting instruments are silvered at a pale straw temper, so that the burning in or fixing of the silver may bring them down just to a proper cutting temper. We understand that proper cutting temper. We understand that the inventor has been fitting up a manufactory for the production of silvered articles in iron and steel, and it is expected it will be brought into full operation in this present month. Beyond these, nothing further of note has been done in electro-metallurgy; and though the advance during the last twelve months has not been very striking, still gradual progress has been made.

#### PHOTOGRAPHY.

During the past year the progress of photography as a science has been small in the extreme, and commercially there has been a decline, in consequence of the depression resulting from one of those great financial panics which, for reasons known to political economists, are much more common in Great Britain than in any other country. The great total eclipse of the sun, visible last August in equatorial Asia, has called special attention to astronomical photography, and this branch of the science will doubtless be considerably improved before it is brought to bear next August upon another total eclipse, visible throughout a large portion of the United States. The recent photographic operations of the English expedition to India proved a failure, because of the want of a skilled photographer upon the staff. The plates were spoilt, because of the drying of the silver ware their surfaces and they were solution upon their surfaces, and they were all under-exposed. The first of these mishaps may always be avoided, and the German expedition at Aden avoided the latter by trying some experimental plates shortly before the totality, to get some clue beforehand to the decline in the actinism of the light produced by the cclipse. Next year, more pictures may be obtained in the same space of time, by adopting the plan of the Germans at Aden, of taking two pictures of the eclipse upon one glass plate. This is done by a simple plan well known to photographers. The sliding dark back, carrying the plate, is lengthened, so that after one picture is taken, and the light cut off, the slide is moved onwards two or three inches, and another picture taken upon the same film. This plan saves half a minute, or more, which otherwise would be lost in changing the slides.

The English apparatus worked capitally during the cclipse, but even in this the German expedition had one slight improvement. The photographic part of their apparatus was not directly fixed to the tube of the telescope lest the necessary motions of the slides should set up vibrations, so the connection was made by means of an india-rubber tube, which also excluded all stray light. In ordinary photographic operations, if the operator desires to get the maximum number of negatives in the shortest space of time, he not only furnishes his camera with a long sliding back, but he increases the number of his lenses, to throw several similar pictures upon different parts of the same sensitive plate. This raises the question whether in photographing solar eclipses it may not be possible to mount two or three reflectors or refractors at the end of a single telescopic tube, so that, say, three pictures are thrown at once upon the plate in a vertical line one above the other. Then, by shifting the plate as already described, six pictures would be obtained upon one film; or, by a second motion of the plate, even as many as nine might be impressed.

Many plans for increasing the permanency of photographic prints have been under consideration at the various societies during the past year, but the results, as regards pictures upon albumenized paper, have been small.

phite of soda solution, and thorough washing of the prints after fixing, being the best guarantees of permanency. After the washing and mounting of such pictures, rolling After the washand waxing seems to increase the stability, by the production of a print with a hard glazed surface, somewhat protected by the wax from deleterious impurities in the air. But no care in silver printing upon albumenized paper seems to give security against fading in the long run, and no photographic chemist of eminence would risk his reputation by the assertion that any such silver pictures are as durable as engravings in printing ink. Messrs. Disderi, Johnson, and others, have been producing some very delicate and beautiful prints upon wet collodion, which prints were afterwards transferred to paper. Little or nothing is as yet practically known about the durability of these pictures, but theoretically there are reasons for supposing that they will last longer than the common kind. At all events, they are more pleasing and engraving-like in appearance, and can be turned out at the same price as their better known rivals.

Carbon was the basis of the best and most imperishable of the inks in use by the monks of old, and there is no doubt that the most permanent photographic pictures at present obtainable upon paper are those produced by the carbon process. Mr. Joseph Swan first produced these pictures upon a commercial scale, and after working the process up to a great state of perfection, he recently sold his patent for a high sum to a London company, who print the pictures at Newcastle, and have offices at the west end. There is no doubt that if the general public had facilities for obtaining permanent likenesses at a moderate extra charge, many would gladly avail themselves of the opportunity, but at present no such facilities are placed in their way. There is scarcely a photographer in London who will undertake to supply carbon portraits on any terms whatever, though we believe that an establishment to turn out these pictures will soon be at work at Wil-

This question of durability of photographs is of far more national interest than is apparent at first sight. If photography had been known in the days of Queen Elizabeth, and the photographers of that time took nothing but fading pictures, so that the London life of the period was thereby pictorially lost to us for ever, except in the imperfect woodcut and flattered oil portrait, what censure we should now heap upon the photographers of old. Yet the photographers of to-day stand a good chance of falling into similar disrepute in the opinion of posterity. Month by month London is changing its physical features with great rapidity. Railways are cutting up its streets in all directions, the Holborn-hill of the past is now, practically speaking, no more, for the viaduct and new streets have already quite changed the appearance of the locality. emple Bar must, unfortunately, soon go down, as it has grown to be so great a hindrance to street traffic; and an overground railway is likely soon to entirely change the aspect of the City-road. Little is thought of these changes at the time they are made, but after the lapse of a few years, accurate pictures of London as it used to be, begin to grow in public interest. There was a time when Oxford-street ran through fields and gardens, when the first sign of civilization greeting the eye of the stranger as he entered London was the gallows, and when people were roasted alive at Smithfield for adhesion to their religious convictions. How photographs of the scenes of those bad old times would be valued at the present day, and who can tell whether the London as it is to-day may not be viewed with horror by those who The very few photographers who are really scientific men, turn out silver prints which in comparison with the general run of such pictures, are stable, fresh and good hyposul-

great historical value. It has many times been stated in these columns that about the best and certainly the most beautiful kind of permanent photographic pictures are transparencies upon collodion, cemented between two sheets of glass with Canada balsam. The balsam in its natural state will not do, as the essential oil it contains gradually evaporates, and at last the picture ceases at places to remain in optical contact with the glass. This essential oil should first be driven off by heat to such an extent that the balsam hardens as it cools, and this hardened balsam should be used in cementation processes. Even this, in some cases, tends to become brittle with age, whereby the plates have a liability to split asunder too easily, so that experiments are desirable to ascertain the best substance to mix with the balsam to increase its tough-

One reason why little progress is made in photography is that the metropolitan photographers, instead of agreeing among them-selves, have split up into three different societies, each having very little funds in hand. The oldest society was once better off, but paid away all its spare funds to a non-resident secretary. The result of all this is, that there are no funds available to push on photographic research, which is left entirely to a few private individuals, most of whom have little time to devote to investigation. If the three London societies would agree to unite into one, so as to have but one array of expenses instead of three, they could soon get a balance in hand applicable to scientific purposes.

#### CHEMISTRY.

THE year which has just closed, although marked by substantial advances in chemical science, has brought to our columns no record of any discovery of unusual or surpassing interest. But the lives of scientific labourers, as the lives of all men, "are made up of little pains and little pleasures—the great wonder-flowers bloom but once in a life-time"; and the little discoveries and little pleasures make up the great sum of happiness and pro gress. We write here mainly of chemistry in its technical relations; but when dealing with this science it is impossible to abstain from mentioning the efforts which have been made in the past year to obtain a more intimate knowledge of the constitution of the heavenly bodies, and our sun in particular, in consequence of the opportunity afforded by the eclipse. The observers have been numerous, the theorists still more numerous, but it would be wrong not to mention as among the most prominent our countrymen Huggins, Miller, Lockyer, and a younger Herschel, and among near or more distant neighbours, Jannsen, Chacornac, and Father Secchi. Their deductions and speculations have to stand the test of time and future discoveries, but they seem to show that we must regard our great lumi-nary as a mass of vividly incandescent matter, of somewhat the same composition as the crust of the planet we exist upon, but enveloped in an atmosphere of hydrogen. But the light as well as the heat are of vast importance to us, and probably we yet know but little of the wonderful influence the former exerts in the material world. We know of many wonderful changes effected by light, but Dr. Tyndall has just opened the way to the discovery of still more. We have to wait, however, for the revelation of the discoveries already made.

Some very important additions to our knowledge of the physical properties of gases have been made in the past year by Graham, Cailletet, and others. The absorption and con-densation of some by metals, the passage of many through iron at all temperatures, have formed the subjects of valuable investigations, the results of which have appeared in our



more striking discovery of giving increased force to the explosion of the cotton. As we recently announced, the explosion of a small detonating charge within a charge of com-pressed cotton literally shatters the cotton to atoms, and so developes a tremendously de-structive force. In the peaceful operations of mining and quarrying this new discovery will give increased value to gun cotton, while for torpedoes and other machines for destroying life in the gross, gun cotton becomes invaluable. We humanely give up the use of an explosive missile for destroying one life at a time, and perfect our means of hurrying hundreds out of the world in one moment. "Thus," as a French cotemporary remarked on the subject, the other day, "the devil loses

In analytical chemistry, we have recorded a noteworthy improvement in the mode of dealing with refractory minerals. By the use of the fluoride of sodium and bisulphate of potash these are fused with the utmost ease, and thus their analysis is made a matter of small difficulty. In the technical applications of our science, numerous improvements of much value have been made. Our patent list, no less than our notices, show how active our chemists and manufacturers have been in the pursuit of means of improving what we may call our staple metallic production—iron.

Much still remains to be done with this metal, but we have assurance that nothing will be left untried to perfect its manufacture. In the ornamental applications of chemistry we have recorded Liebig's improvements in his process of silvering glass, which now leaves nothing to be desired, but careful hands, in carrying out his directions. We have also recorded a modification of this process for gilding glass. Wagner also has given to us some important information on the production of bronze powders, a branch of manufacture which has been infew hands, and about which but little has been generally known.

New "soda processes" have, of course, been annunced, but as yet not one that is likely to take the place of Leblanc's. Soda waste has also been the subject of many modes of treatment, but it still offers an important field of experiment to chemists. "Waste" is a word which it is one province of chemistry to banish from our vocabulary. Our retrospect this year is necessarily short: let us go on in the hope that the year now opening may bring us more materials for next year's sur-

vey.

The obituary of the past year is happily short also. In the elder Herapath, a keen sagacious mind, of much experience in toxicology and the technical applications of chemistry has been lost; and in the younger Herapath, a man of great ability and once of much promise, was removed before he attained middle age. His name will last in scientific records in connection with his artificial tourmalines. Dr. Daubeny, with some repute as a chemist, was better known as a geologist, who will long be remembered in connection with his persevering labours on volcanoes.

#### CONCLUSION.

We have now reviewed the leading features of the past year, have pointed out the direction in which scientific improvements may be looked for, and have indicated the fields open to engineering enterprise. There is good earnest work in the future for all to perform, and there are still those among us who can perform it. Some have passed away from the scenes of their labour and toil who could apparently be but ill spared; others, however, will arise to fill their places, as and when they are required, neither sooner nor later. And so the balance in this, as in all other things, is fairly and evenly maintained. Let not him that works honestly and honorably on in life's by paths be discouraged because others have men to fame, whilst his merits are unacknow-ledged. There is room enough for all, and colleges." London: Thomas Murby, 32, Bouverie-street, E.C. bye paths be discouraged because others have

which he is entitled. If honour and renown be our due, it will overtake us at the proper season; all our fretful struggling and striving cannot hasten it—all the barricades with which envy may surround us cannot retard it. Till it comes let each and all manfully press onward to the appointed end, patiently learning the great lesson of life-endurance. In a word, let us-

Learn to labour and to wait.

#### NOTICES OF BOOKS.

ONE of the most prominent features of modern times has been distributed by modern times has been that every thing We are not content with simply possessing the information, but we must apply it. In the preface to the treatise on plane geometry, by Mr. Wormell, now before us,\* the author draws attention to the fact that the ancient philosophers were satisfied with the acquisition of abstruse knowledge, and cared little or nothing about applying it to any useful purpose; on the contrary, they regarded it as infinitely beneath them to endeavour to practically utilize their acquaintance with mathematical and physical science. Our author, however, departs in some measure—and we consider very advantageously for his readers—from the beaten track, and defines, or, rather, illustrates, many of the ordinary geometrical principles by familiar and interesting practical allusions. Instead of confining himself strictly to the elucidation of the various axioms and problems by the aid solely of lines and angles, he partially explains them by means of reference to objects of every-day occurrence. We will select one example, which will serve to demonstrate the gist of our remarks. The ordinary definition of a straight line is "that which lies evenly between its extreme points." Among other definitions given, Mr. Wormell says:—Take a piece of paper, and fold it: the crease is a straight line. There is no doubt but that to the majority of intellects, the latter definition will be the more readily comprehensible, and in addition we fail ourselves to perceive any merit in a person going in a round-about and tedious manner to gain information, when the path lies clear and open before him.

After investigating the properties of lines and angles, the third chapter introduces us to those of the circle, wherein the division of it is illustrated by allusion to the quadrant and protractor. The importance of the parallelogram in mechanics is rendered evident, and, as an instance, it is mentioned the use made of it, in the early days of machinery, by Watt, who employed it as a means of producing oscillation in the balance beam from the vertical motion of the piston. In a similar manner, the rhombus is the figure adopted to convert a vertical motion into a lateral one, as evidenced by the governor of a steam engine. The subjects of areas, polygons, and ratios are fully entered into and explained. With the accompaniment of a drawing board, T-square, and case of instru-ments, the student who chooses to apply himself, could not fail to master the whole art of geometry by means of Mr. Wormell's excel-

lent little work.

Mr. Stanley, the mathematical instrument maker, of Great Turnstile, Holborn, has just published a second edition of his very useful treatise on drawing instruments. The matter is the same as that of the first edition, with the exception of some additional matter and illustrations. These consist of the engraver's tray, the copying table, the set square for section lines, a full description of the planimeter, a gauge for cutting off drawings, and some few smaller matters. We cannot do better than recommend Mr. Stanley's work to the notice of those who may have young

friends in the engineering or architectural professions. To these latter the treatise will ust now form a seasonable and useful little present.

A few more annuals have reached us, the most prominent being Letts's diaries for the These are to be had in every new year. form and shape, and in cost from a few pence to pounds, so that every one may be suited. The No. 8 Diary published by Messrs. Letts is, perhaps, the most generally useful, and is a reasonable price. Besides the diaries of this firm, we have to notice their portable secre-taire, which will prove a very valuable invention in the office, board room, library, and even in the school room. In an exceedingly small place it contains note and letter paper of various sizes, with suitable envelopes, ink, cutlery, &c.; a small library of such books as are commonly referred to, and a receptacle for answered and unanswered letters. flap falls down in front, and whilst exposing the whole to view, forms itself the writing

We have received the "Temperance Yearbook of Facts and History for 1869," published by Mr. Tweedie, of No. 337, Strand, and "Young England's Almanack and Naturalists' Calendar for 1869," from the same office. Both these productions are full of interest to those to whom they address them-

"The Post Magazine Almanack and Insurance Directory for 1869" (W. J. Stokes, Wine Office-court, Flect-street), contains, as usual, a vast amount of useful information. It reflects great credit on its respected editor, Mr. J. Hooper Hartnoll, who has taken every care to render the work perfect for all purposes of reference. As an instance of the trouble taken by Mr. Hartnoll to secure accuracy, we may refer to the details under the head of "India Office." The whole of the departments have been remodelled, there being now eight instead of six, as heretofore; and these changes are all noticed. Every name in the list of directors of insurance companies and in the insurance directory, nearly 4,000 in number, has been verified; and no pains have been spared to secure accuracy in the whole of the information given respecting these important institutions.

#### THE INSTRUCTIONS OF THE GAS REFEREES.

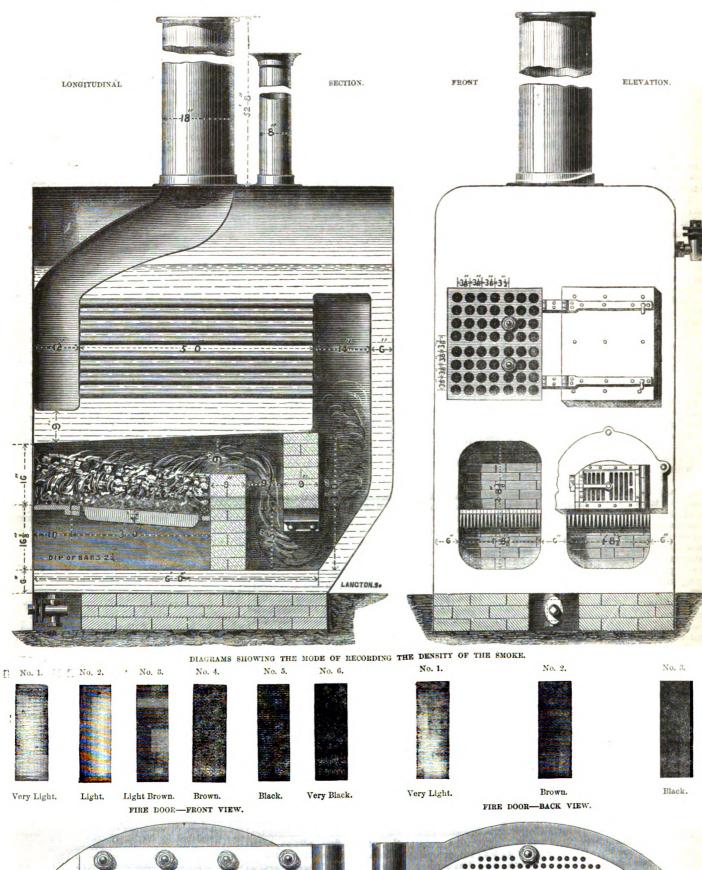
WE find we owe somewhat of an amende to the gas referees. We learn that the copy of instructions which fell into our hands, and which we had good reasons for supposing had been regularly issued, was really considered a rough proof open to correction. And, indeed, some of the directions we commented upon might well have been considered as oversights or slips of the pen. These have been corrected in the copy now definitely issued; and some instructions still retained we have little doubt will be amended as experience is gained in carrying them out. It is but fair to say that the task the referees have had has not been an easy one; and we hope that the working of the Act will show that the interests of the consumers have been well considered.

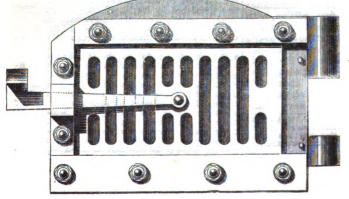
THE MANUFACTURE OF WATCHES AND CLOCKS.

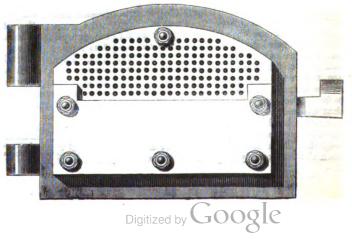
—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends this pamphlet to any address on receipt of two postage stamps, and we cannot too strongly recommend it to the notice of the intending purchaser.—| ADVT.]



### THE WIGAN COAL TRIALS, FURNACES, ETC.







#### THE WIGAN COAL TRIALS.

N August last we gave some particulars of the experiments with coal which have been carried out at Wigan, and we now append the detail report of Mr. Lavington E. Fletcher, the engineer of the Manchester Boiler Association, together with engravings illustrative of the whole subject.

REPORT.

I have now the pleasure of presenting to our members condensed tables of the results obtained at the first series of Wigan coal trials, referred to in the monthly report for July last, as well as a brief account of the mode of conducting the experiments. The special object of this series of trials was to show the suitability of the South Lancashire and Cheshire coals for use in Her Majesty's Navy. The trials were carried out at the expense of the South Lancashire and Cheshire Coal Association, under the superintendence of the late Dr. Richardson, of Newcastle, and myself, and it is with the permission of that Association that these particulars are presented to our members. I propose to describe, in the first in-stance, the mode of conducting the investigation with the testing apparatus employed; in the second, the preliminary trials, with the modifications in the furnaces and treatment of fires arrived at; and in the third, the permanent trials, with their results.

1. Description of the Mode of Conducting the Trials and of the Testing Apparatus EMPLOYED.

The principle on which these trials were conducted was simply that of ascertaining by practical experiment in a steam boiler how much water a pound of coal would evaporate; also at what speed that could be done, and whether with or without the formation of smoke. To this end all the water evaporated was accurately measured; the coal carefully weighed; and the time expended in doing a given amount of work noted; added to which the amount of smoke emitted was

Measurement of the Water.—Water meters are not always to be relied upon, and, therefore, to avoid every chance of mistake, or even suspicion of inaccuracy, a tank was employed of sufficient size to carry through an entire experiment with a single charge. This tank, which had a superficial area of 50 square feet, and thus a capacity of 2641b. per each inch in depth, was fitted with a float, which, reposing on the surface of the water, rose and fell with it, and operating upon a pointer travelling over a scale graduated in feet and inches, indicated the precise amount consumed, as well as the rate of progress throughout the trial.

It is usual in such trials to evaporate the water at atmospheric pressure, so as to afford a common for the comparison of different experiments, while it has the further advantage of dispensing with the necessity of a pump, and of very much reducing the chances of waste from leakage. The plan had been adopted by the Admiralty in previous trials, and, therefore, was followed on the present occasion. The tank was placed at a short present occasion. The tank was placed at a short distance from the boiler, and at a sufficient height for the water to flow into it by its own weight, the two being connected by a pipe 2in. in diameter, which was fitted with a stop tap, so that the supply could readily be controlled by hand, while the whole was placed so as to be quite open to view, so that no loss from leakage could go on unobserved.

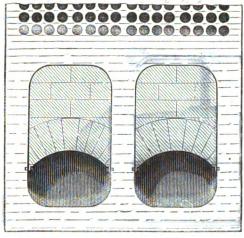
The feed-water was supplied to the boiler at its natural temperature, whatever that might happen to be, but as this varies at different times, and clearly affects the result, it is important that an allowance should be made for these variations, so as to admit of the correct comparison of different experiments. It is, therefore, customary to qualify the amount of water evaporated by the temperature of the feed, and to reduce it to a standard of so many pounds of water evaporated from a temperature of 212deg. or 100deg. as may be decided on. As the standard of 100deg. had been adopted by the Admiralty in previous experiments, it was adhered to on the present occa-

sion, and the necessary qualification made.

Mode of Weighing the Coal.—The coal was weighed in charges of 200lb., and shot down in front of the boiler so as to be kept entirely distinct from the general stock.

Description of the Test Boiler.

SECTION SHOWING INVERTED BRIDGE.



yard, Keyham, for testing the value of coals, it was proposed by Dr. Richardson that to avoid all question a precisely similar one should be used for the Wigan trials, and with this view a fac-simile of the Keyham test boiler was made from drawings kindly furnished by T. W. Miller, Esq., chief en-gineer at Her Majesty's Dockyard, Keyham. This boiler was of very cramped proportions, and by no means calculated to develope the highest results from the coals, but it was adhered to for the reasons just given. It measured 7ft. Sin. in length, 8ft. 10in. in height, and 5ft. in width, and contained 124 flue tubes, 5ft. long and 2¼in. diameter inside, with two furnaces each 1ft. 8§in. in width. The heating surface afforded by the tubes was 365 square feet, by the flame chamber and furnaces, including the ashpit, 128 square feet, making a total of 493 square feet of heating surface. The equipment of square feet of heating surface. The equipment of the furnaces was of the usual class, consisting of an ordinary firedoor, dead-plate, set of firebars, and single vertical brick firebridge, the firedoor being fitted with a sliding grid for the admission of air when required, and a perforated box at the back for the dispersion of the current. To give a better idea of the proportions of the boiler with the furnace mountings two cuts are appended, the first of which gives a longitudinal section through one of the furnaces, the other a front external elevation, added to which there is subsequently given an enlargement of the firedoor.

Method of Estimating the Amount of Smoke.-To accomplish this, an observer watched the chimney throughout the whole experiments, and noted every minute in which smoke occurred, the density being defined by gradations of 1 2 3 4 5 6, as shown in the diagram.

In the tables accompanying this report, however, the six gradations just given are reduced to three for the sake of simplicity, under the designations of "very light," "brown," and "black," as shown in the diagram.

2. PRELIMINARY TRIALS WITH THE MODIFICATIONS MADE IN THE FURNACES AND TREATMENT OF THE FIRES.

At the commencement of the trials only 8.01lb. of water were evaporated by 1lb. of coal, and 35.88 cubic feet of water by the boiler per hour, with a consumption of 20lb. of coals per hour per square foot of firegrate; subsequently, however, the results were considerably improved, and 11 11lb. of water were evaporated by one of coal, with a speed of 46:19 cutic feet of water per hour, and 25lb. of coal per hour per square foot of firegrate. This improvement was obtained simply by slight modifications in the proportions of the furnaces and treatment of the fires.

It would be interesting to trace all these modifications, and to give the results of each. This, however, would be a work of too great length for the present occasion. Suffice it, therefore, to say, that 115 preliminary experiments were made, during which it was found of advantage to reduce the length of the firegrate from 4ft. to 3ft., to adopt a blind dead plate in preference to a perforated one, and to slightly lower the level of the firegrate so as to increase the flame chamber above the bars, while there is no doubt that a further advantage would have been gained by lowering the bars still baseription of the less Boner.—As these trials would have been gained by lowering the bars still more had special reference to the suitability of the coals of this district for steam purposes on board Her Majesty's Navy, a boiler of the marine multi-tubular type was adopted; and, further, as a special one is employed at Her Majesty's Dock-while the addition of an inverted or hanging bridge

behind the ordinary vertical one was found of advantage in preventing smoke, its action being to assist in mixing the gases and maintaining the temperature of the furnaces. The construction of temperature of the furnaces. The construction of this bridge will be readily understood on reference to the accompanying cut.

The following figures will show the result of its working :-

COMPARATIVE TABLE OF RESULTS WITH AND WITHOUT INVERTED BRIDGE.

	of	at	Smoke per hour			
NAME OF COAL AND CHARACTER OF TRIAL.	Lbs. of Water at 10 evaporated per lb. Coal.	Cubic feet of Water 100° evaporated' I hour.	Minutes of Very	Minutes of Brown.	Minutes of Black.	
Haigh Yard Coal with Inverted Bridge	11.24	47:38	0.5	0	0	
without Inverted Bridge	11.05	51.31	2.5	0	0	

The number of perforations for the admission of air through the firedoors were also modified. the first instance, there were 730 giving an area of 3.2 square inches per square foot of firegrate. These were afterwards reduced by bolting a blank plate over the lower part of the doors, so as to make the number of perforations 342, equal to an area of 1.6 square inch per square foot of firegrate. It is thought that the benefit from this change arose more particularly from the alteration in the point admission, and it was afterwards found necessary with the thickest fires to leave the doors lin. or  $1\frac{1}{2}$  in. ajar for a minute or so after firing to prevent the formation of smoke. The proportions of the the formation of smoke. The proportions of the furnaces finally adopted, with the length and level of grate, and arrangement of fire bridges, are those shown in the cuts of the boiler already referred to, while the enlarged view of the firedoor will show its general construction and the final number of perforations:

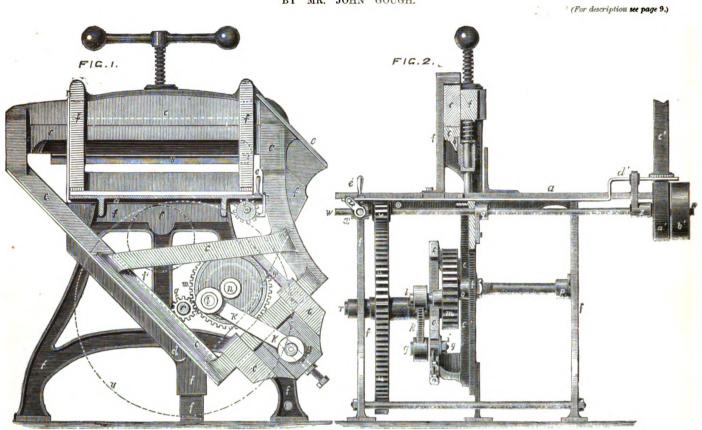
In addition to the modifications in the proportions one termed "spreading," the other "coking." In "spreading" firing, the coal is scattered evenly over the whole surface of the firegrate, commencing generally at the firebridge and working forward to the firedoor. In "coking" firing, the charge of coal is thrown on to the dead plate in front of the bars and allowed to lodge there for a time in order that the mass may become coked through, and when that is done, the crest is pushed back towards the bridge, and another charge thrown on to the front of the fire in its place. In this way the gases are gradually evolved from the coal at the front, while a bright fire is maintained at the back, over which the gases pass. On trying the two plans, coking firing was found to give a more economical result than spreading, and at the same time to produce less smoke, while, in addition, a higher result was obtained by thickening the fire from 6 to 9in., and again from 9 to 12in. "Coking" firing was therefore adopted as the standard firing was therefore adopted as the standard method, and with fires 12in. thick, while the fur-naces were charged alternately, and the perforations allowed to remain open for a few minutes after charging for the prevention of smoke.

(To be continued.)



### GEARING FOR PAPER-CUTTING MACHINE.

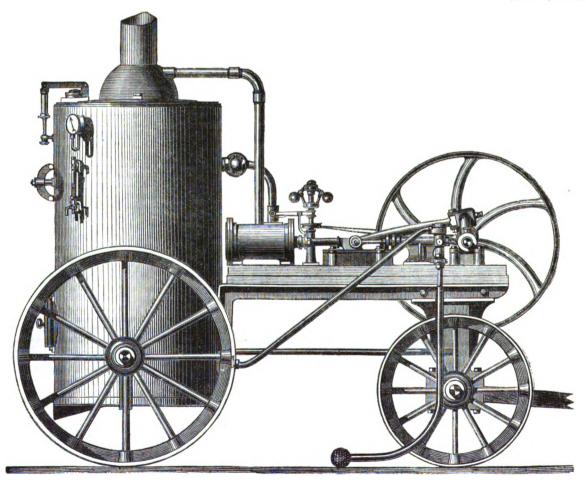
BY MR. JOHN GOUGH,



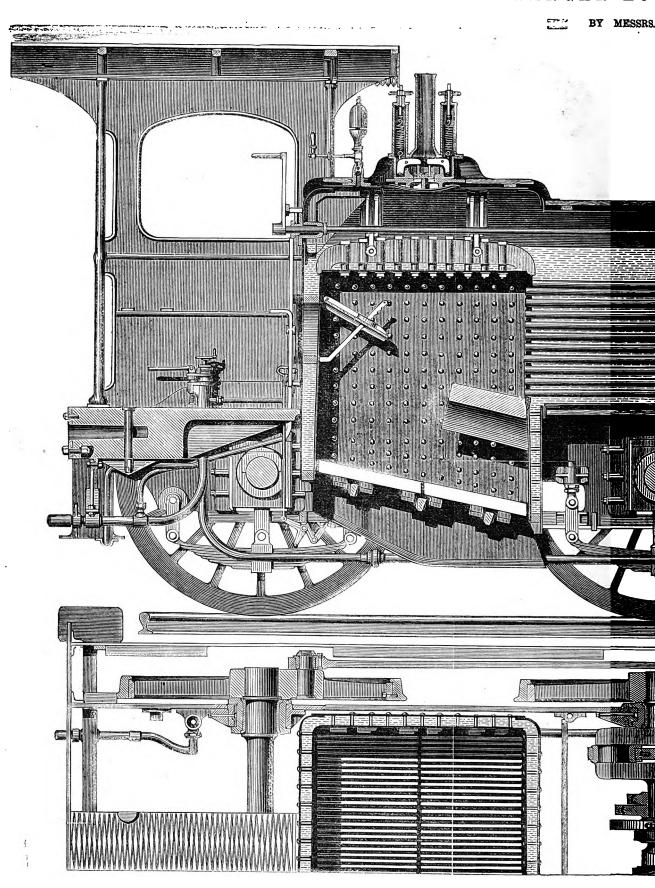
### PORTABLE ENGINE.

BY MR. T. WILKINS.



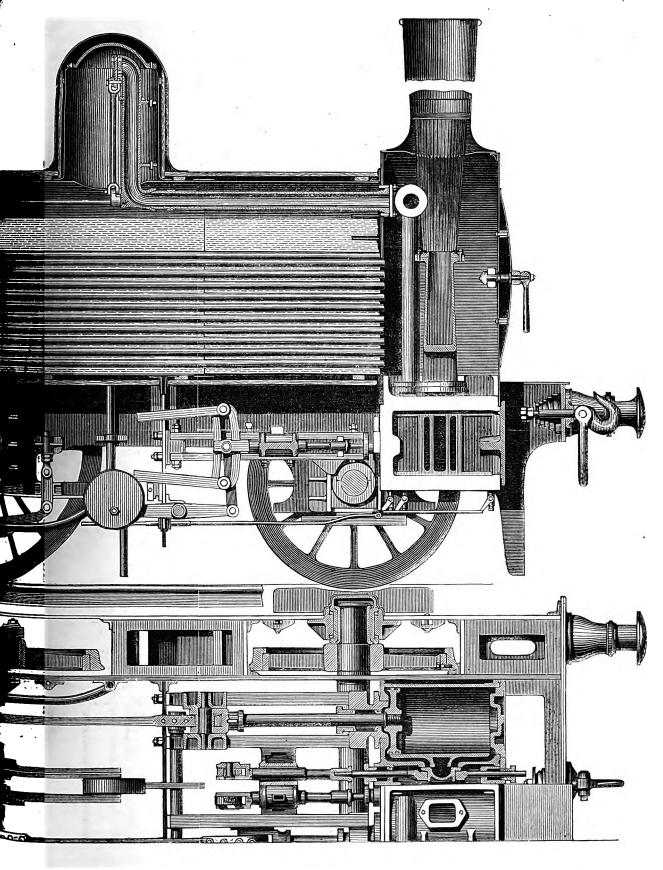


### PASSENGER LO



## MOTIVE ENGINE.

ON AND CO.



#### PASSENGER LOCOMOTIVE ENGINE.

OUR double page engraving this week represents a fine passenger locomotive engine, constructed by Messrs. Kitson and Co., of Leeds. The design of this engine leaves little to be desired, and in of this engine leaves little to be desired, and in point of finish the workmanship fully maintains of cylinders, 1ft. 4in.; stroke of cylinders, 1ft. 10in.; the high character long enjoyed by the firm. The following are the principal dimensions:—Diameter distance between centres of cylinders, 2ft. 5in.; diameter of coupled wheels, 5ft. 6in.; diameter of leading wheels, 4ft.; total wheel base, 15ft. 6in.; centres of coupled wheels, 7ft. 9in.; length of barrel of boiler, 10ft. 6in.; diameter of barrel of boiler outside, 3ft. 10in.; height of centre line of boiler above rail, 6ft. 14in.; length of firebox casing, 4ft. 9in.; height of ditto at front, 6ft. 6\frac{3}{2}in.; height of ditto at foot, 4ft.; length of firepox at a bottom, 4ft.; length of firepox at front, of ditto, 3ft. 5in.; height of firebox at front, width of ditto, 3ft. 5in.; height of firebox at front, casing at bottom, 4ft.; length of firegrate, 4ft. 2in.; width of ditto, 3ft. 5in.; height of firebox at front, 4ft. 103in.; height of ditto at back, 4ft. 13in.; length of tubes between tube plates, 10ft. 93in.; diameter of ditto outside, 2in.; number of tubes, 140. Heating surface: tubes (external surface), 790 square feet; firebox, 82 square feet; total, 872 square feet, 16th. cases of firebox, 82 square feet, 16th. cases feet. 790 square feet; firebox, 82 square feet; total, 872 square feet; area of firegrate, 14½ square feet; steam space with water level 4in. above firebox crown, 36 cubic feet; weight of engine empty—on leading wheels, 8½ tons; ditto on driving wheels, 8½ tons; ditto on trailing wheels, 8½ tons; total 25½ tons; weight of engine in working order—on leading wheels, 9 tons; ditto on driving wheels, 9½ tons; ditto on trailing wheels, 9½ tons; total, 28 tons.

#### GEARING FOR PAPER-OUTTING MACHINES.

THE invention which we illustrate on page 8, has been patented by Mr. John Gough, of 42, Kirby-street, Hatton-garden. It consists of improved gearing for actuating the knife in paper-cutting machines, and is specially applicable to Wilson's machines, in which the first motion shaft requires to be reversed in order to bring back the knife. In this class of paper-cutting machines the diagonal frame to which the knife is attached is now actuated by a pinion fast on the second motion shaft of the machine; this pinion is caused to gear with

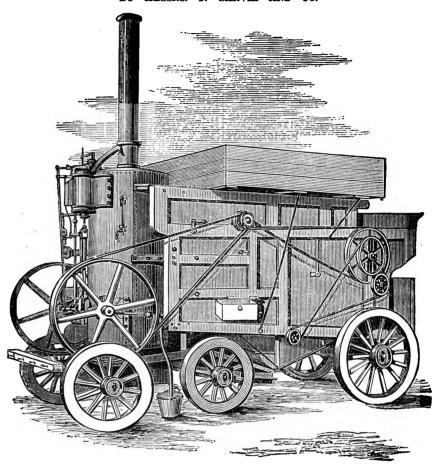
requires to be reversed in order to bring back the knife. In this class of paper-cutting machines the diagonal frame to which the knife is attached is now actuated by a pinion fast on the second motion shaft of the machine; this pinion is caused to gear with two toothed racks fixed opposite to one another on the interior of the lower portion of the diagonal frame. Into one rack it gears directly, and into the other through the medium of a toothed wheel mounted on a stud fixed in the frame of the machine. Mr. Gough disponses with these toothed racks and gives the required motion to the frame by means of a crank on the stud, the pin of which crank is fixed in the side of the toothed wheel on the stud. The motion of the crank is transmitted to the diagonal frame through the medium of a connecting rod.

Fig. 1 in our engraving represents a front elevation of the machine, partly in section; fig. 2 represents a side elevation of the machine; also partly in section. a represents the table for giving support to the paper while being cut; b, the knife; and c, the diagonal frame to which it is attached, and which frame is free to move up or down in the guides a and a, formed in the framework / of the machine; g represents a pin fixed in the lower portion of the diagonal frame c, which pin can be adjusted as to position by means of the screw h, and made secure by means of the nut i; k denotes a rod by means of which the pin g is connected with the crank pin i, which is shown fixed in the side of the toothed wheel m, which wheel is mounted on the stud n, which is supported at and p in the frame / of the machine; g represents a pinion which gears into the toothed wheel m, and which is fixed on the second motion shaft r, which is carried in the bearings s and in the frame / of the machine. Next the bearing s a large toothed wheel w is fixed, which gears into a pinion v, fixed on the first motion shaft w; formed in the frame / of the machine.

The mode of operation is as follows:—The paper having been placed on the table a, a

#### ENGINE AND COMBINED THRASHING MACHINE.

BY MESSRS. T. GARVIE AND CO.



that the action of the machine becomes continuous, and the first motion shaft does not require to be reversed, as at present is the case in this class of

#### PORTABLE ENGINE.

A BOUT two months since, we described and illustrated a very good horizontal engine, by Mr. T. Wilkins, of Ipswich. We now give an example of one of another class by the same maker. It is a portable engine which can compete with most of its kind for cheapness. A cast-iron bed-plate is belted on to a pair of T-iron horizontal stays connecting the belier with the fore axle, which is mounted on a large spherical joint to allow for inequalities on the road, as is done in the case for inequalities on the road, as is done in the case of some French portable engines. The engine is 4-horse power. The boiler is 5ft. 6in. by 3ft., fire-box 2ft. 6in. by 3ft. high, and has eight 2\frac{1}{2}in. tubes from its roof to top of boiler; the wheels are 4ft. and 2ft. 9in. diameter, and fly-wheel 3ft. 6in.; the cylinder is 6\frac{1}{4}in., stroke 10in., pressure carried 45ib., total weight of engine short 45ext. total weight of engine about 45cwt. The crank shaft bearings are solid block brass bushed. Simplicity is certainly carried to the fullest extent in this engine, and its cheapness will recommend it to

#### COMBINED ENGINE AND THRASHING MACHINE.

WE illustrate in the annexed engraving a new combined engine and thrashing machine, invented and built by Messrs. T. Garvie and Oo., of Fish-street, Aberdeen. The front frame on which the engine stands is made of oak, and two rings of angle iron, one riveted to boiler and the other fastened to the frame, forms a swivel. Besides this, the two front wheels swivel with a ball and socket joint to a certain extent. The reason for putting the boiler at this end is because the engine frame draws the machine, which is light, and consequently there is no undue strain on the mill-framing. The drum-shaft, as will be seen, is driven by two belts from the two fly-wheels. The boiler is of the tubular construction,

with a cone plate over the top tube-plate, which connects to the funnel and gives a large amount of steam room. The boiler is made of Lowmoor Iron steam room. The boiler is made of Lowmoor Iron throughout, and is 7ft. 6in. by 3ft. The engine has a 6in. cylinder and 10in. stroke; fly-wheels, 3ft. 6in. diameter; speed of engine, 205 revolutions per minute; working pressure of boiler, 60lb. to 80lb. The whole weight of engine and boiler is 30cwt. Two horses draw the machine on good roads and three on bad roads. The machine is at present doing work through Aberdeenshire, and has not had any repairs.

#### INSTITUTION OF CIVIL ENGINEERS.

THE annual general meeting of the Institution of Civil Engineers took place on the 22nd ult., Mr. C. H. Gregory, president, in the chair. From the report of the Council we learn that the following papers were read and discussed during the last session:—The irrigation in India, Spain and other warm elimeters and on the Spain, and other warm climates, and on the proper construction of irrigating canals; the manufacture and wear of railway bars; the relation of the fresh water floods of rivers to the areas and physical features of their basins; on floods in the Norbudda Valley, with remarks on monsoon floods in India generally; on the Victoria Bridge on the line of the Victoria Station and Pimlico Railway; on new the Victoria Station and Pimlico Railway; on new railways at Battersea, and the widening of the Victoria Bridge; the City Terminus Extension of the Charing-cross Railway, embracing a description of the Cannon-street bridge and station; the durability of materials; the supporting power of piles, and on the pneumatic process of sinking iron columns, as practised in America; and the experimental determination of the strains on the superposity ties of a howstring girder. Although experimental determination of the strains on the suspension ties of a bowstring girder. Although the topics thus dealt with had been comparatively limited in number, yet it was believed they might be fairly regarded as representing some of the principal problems now engaging the attention of engineers. There was, for instance, probably no question of greater national importance, having regard to the interests and welfare of so many of the Queen's subjects, than that of irrigation. Hitherto the records of the Institution had been a blank upon this branch of engineering practice while treatises on the subject, at least in the English language, had previously been almost entirely

Manual Section Control Control

For these communications various premiums had been awarded, which were presented after the reading of the report, including Telford medals and Teling of the report, including Telford modals and Telford premiums of books to Messrs. G. Higgin, C. P. Sandberg, W. Wilson, C. D. Fox, and J. W. Barry, and Lieut-Col. O'Connel, R.E.; a Watt medal to Mr. E. Clark; a Telford medal to Mr. W. J. M'Alpine; Telford premiums of books to Messry. T. Login, A. Wilson, and W. Airy; and the Manby premiums of books to Mr. A. C. Howden. It was noted that Mr. E. Clark had previously received a Telford medal from the Institution.

The report further stated that the new building

The report further stated that the new building, with furniture, cost upwards of £17,000. There were on the books on November 30 last, 16 honorary members, 637 members, and 896 associates, making a total of 1,549, inclusive of students. The admissions to the class of students, which had only been in existence one session, had amounted to the same date to 133.

The deceases announced during the year had been:—Sir David Brewster and Lord Brougham, been:—Sir David Brewster and Lord Brougham, honorary members: George Rowdon Burnell, Alexander Gordon, Daniel Gallagher Grose, George Alfred Jermyn, Michael Lane, George Holsworthy Palmer, Thomas Rhodes, and William Swinburne, members; Henry Goulburn Anderson, Thomas Long Colley, Isaac Curran, Andrew Henderson, Peter Hogg, Frederic Cornell Reynolds, Robert Sharpe, Francis Adolphus Smart, Thomas Hitchin Smith, William Strode, William Swann, and John Vaughan, associates. Vaughan, associates.

The following gentlemen were elected to fill the several offices on the council for the ensuing year:—Charles Hutton Gregory, president; Joseph Cubitt, Thomas Elliot Harrison, Thomas Hawksley, and Charles Vignoles, vice-presidents; James Aberand Charles Vignoles, vice-presidents; James Abernethy, William Henry Barlow, John Frederich Bateman, Joseph William Bazalgette, Nathaniel Beardmore, Frederick Joseph Bramwell, James Brunlees, George Willoughby Hemans, John Murray, and George Robert Stophenson, members; and Major-General Sir W. T. Denison, K.C.B., and Frederick Ransome, associates,

#### NEW YORK SOCIETY OF PRACTICAL ENGINEERING.

THIS Society held its usual semi-monthly meeting at its room in the Cooper Union Building, New York City, on the evening of Tuesday, October 18, James A. Whitney, the President of the Society,

Tat its room in the Cooper Union Building, New York City, on the evening of Tuesday, October 18, James A. Whitney, the President of the Society, presiding.

"Air Motors and Atmospheric Propulsion" constituted the subject regularly before the meeting and a paper upon the same, by Perry Dickson, M.E., was read by the recording secretary, Mr. William B. Harrison. The paper set forth the peculiarities, of some of the earlier English projects in this line, which a score of years since were prominently before the public, and also weighed and compared the merits and demerits of the several plans now meeting with more or less approval at the hands of engineers. Foremost among the earliest-tried systems was that in which a tube was laid longitudinally between the tracks. with an opening formed lengthwise in its upper part for its whole length. The piston travelling within the tube was connected by an arm extending through the slot with the car above, and the slot itself was covered by a flap valve attached at one edge to one side of the slot, so as to yield and open to permit the arm to pass and yet close the slot in front of and behind the arm. The air being exhausted in front of the piston, the latter was moved along by the pressure of the atmosphere behind it, and of course propelled the car with which it was connected. In another plan the slot was closed by the two elastic lips composed of pipes of soft material filled with air, the piston arm being made flat like a knife blade, and sliding between the lips which closed before and behind it; but these, as well as several other methods which were tried, proved futile in practice, inasmuch as it was found impossible to keep the valve mechanism in proper repair. When in good order, either of these devices enabled a pressure of about 101b. per square inch on the pistons to be obtained, and very good results were thus secured.

The writer also considered the mode frequently proposed of carrying tanks on the cars to hold the air under compression for the driving engines,

case the air was compressed to a high degree, which is the only way that would enable the size of the tanks to be reduced. With regard to the plan of employing tanks removable from the car when exhausted, so as to be replaced by those charged with air compressed for use, the loss of time involved in the substitution of one tank for another at volved in the substitution of one truk for another at frequent intervals was deemed sufficient to condemn it. The author also commented upon the "pneumatic tube" plan, in which the carriage is itself the piston, and is propelled through the tubular way by exhausting the air in front thereof. His opinion did not differ materially from that very generally held, that although this system is capable of useful development in the carriage of parcels, it cannot compete successfully with other means of passenger transportation. Carbonic acid gas engines, the use of which for car propulsion has been sometimes suggested, were dismissed with a few remarks, the gist of which was, that if the gas was wasted it would prove too extravagantly expensive for practical purposes, while if it was collected in a receiver upon the car after leaving the engine, such receiver would be of ridiculously large dimensions. The writer concluded by explaining a plan of his own, which he claimed to be free from the systems hitherto propounded. In this a tubular magazine of compressed air is to be laid between the tracks, and furnished with devices by which the air is automatically conveyed at intervals from the magazine to small-sized tanks on the car, this being done when required without stopping the car, and the air being compressed in the magazine by the aid of stationary engines.

A lively discussion succeeded the paper, in the frequent intervals was deemed sufficient to condemn

pressed in the magazine by the aid of stationary engines.

A lively discussion succeeded the paper, in the course of which Mr. Creuzbauer stated that he thought Mr. Dickson's method possessed one important advantage—in this, that the air could be used at a comparatively low pressure. When the air is compressed, say, by a pressure equal to seven atmospheres, the radiation or loss of the resultant heat will reduce the working value or power of the same to about four atmospheres, and this ratio of loss increases in the same proportion as the pressure is increased.

S. Carson explained a system brought forward by himself some years ago, in which the car tanks were replenished at intervals from stationary reser-

by filmsen some years ago, in which the car tains were replenished at intervals from stationary reservoirs, and the valves of the car engine were so arranged as to secure a uniform speed, by admitting the air to the engine in inverse proportion to the degree of pressure in the tank.

Mr. J. K. Fisher said that while he possessed but little faith in atmospheric propulsion, he believed no difficulty would be experienced in retaining air in the tanks at a high pressure. In some of the carly English trials the tanks were commonly charged on Saturday, and left over in that condition until the succeeding week.

Mr. James Harrison showed a model of a machine for cleaning the snow from streets, railway tracks, &c., by melting it, and which differed from an apparatus exhibited by him at a previous meeting of the Society, chiefly in the use of a furnace, in connection with exhaust steam from the boiler, to melt the snow as fast as carried to the top plate of the machine as it moves along. The consideration of this invention drew out several ideas relating to the melting of the snow as it lies on the pavement, the melting of the snow as it lies on the pavement, the use for the purpose of downward blasts of hot air, of exhaust, and of combined waste steam and hot products of combustion from the boiler furnaces, being severally indicated by different members.

MANUFACTURE OF EXTRACT OF MEAT.

MANUFACTURE OF EXTRACT OF MEAT.

THE following particulars of the manufacture of Liebig's extract of meat at the company's establishment at Fray Bentos, Uruguay, South America, are from the Buenos Ayres "Standard":— The new factory is a building that covers about 20,000 square feet, and is roofed in iron and glass. We first enter a large flagged hall, kept dark, cool, and extremely clean, where the meat is weighed and passed through apertures to the meat-cutting machines. We come to the beef-cutting hall, where are four powerful meat-cutters, specially designed by the company's general manager, Mr. Gribert; each machine can cut the meat of 200 bullceks per hour. The meat, being cut, is passed to "digerators" made of wrough tiron; each one holds about 12,00016 of beef; there are nine of these digerators, and three more have yet to be put up. Here the meat is digerated by high-pressure steam of 751b. per square inch; from this the liquid which contains the extract and the fat of the meat proceeds in tubes to a range of fat separators, of peculiar construction. Here the fat is separated in the hot state from the extract, as no time can be lost for cooling operations, otherwise the fat is separated in the hot state from the extract, as no time can be lost for cooling operations, otherwise decomposition would set in in a very short time. We proceed downstairs to an immense hall, 60ft. high, where the fat separators are working; below them is a range of five cast-iron clarifiers, 1,000 gallons each, worked by high-pressure steam through Hallet's tube system. Each clarifier is provided with a very ingenious steam tap; in the monstrous clarifiers the albumen and fibrine and phosphate of magnesia

are separated. From hence the liquid extract is raised by means of air-pumps, driven by two 30-horse power engines, up to two vessels about 20ft. above the clarifiers; from thence the liquid runs to the other large evaporators. Now we ascend the staircase reaching the hall, where two immense sets of case reaching the hall, where two immense sets of four vacuum apparatus are at work, evaporating the extract by a very low temperature; here the liquid passes several filtering processes before being evaporated in vacuum. We now ascend some steps and enter the ready making hall, separated by a wire gauze wall, and all windows, doors, &c., guarded by the same to exclude files and dust. The ventilation is maintained by patent fans, and the place is extremely clean. Here are placed five ready making pans, constructed of steel plates with a system of steel discs, revolving in the liquid extract. These five pans, by medium of discs, 100 in each pan, effect in one minute more than two millions square feet evaporating surface. Here concludes the manufacturing process. The extract is now withdrawn in large cans, and deposited for the following day. Ascending a few steps we enter the decrystallizing and packing hall, where two large cast-iron tanks are placed, provided with hot water baths under their bottoms; in these tanks the extract is thrown in quantities of 10,000lb. at once, and here is decrystheir bottoms; in these tanks the extract is thrown in quantities of 10,000lb. at once, and here is decrystallized and made a homogeneous mass, and of uniform quality. Now samples are taken and analyzed by the chemist of the establishment, Dr. Seekamp, under whose charge the chemical and technical operations are performed. It may be mentioned that the company's butcher kills at the rate of eighty oxen per hour; separating by a small double-edged knife the vertebre, the animal drops down instantaneously on a waggon and is conducted to a instantaneously on a waggon, and is conducted to a place where 150 men are occupied dressing the meat for the factory, cutting each ox into six pieces; 400 are being worked per day.

#### Correspondence.

THE HAND SCREW PROPELLER FOR BARGES AND BOATS.
TO THE EDITOR OF THE "MECHANICS" MAGAZINE.

SIR,—I shall feel obliged by your allowing the following remarks to appear in your very useful magazine, upon what I believe to be a valueble and new invention. Having frequently noticed the labour and difficulty of propelling and guiding barges and boats, I have, for some time past, devoted my attention to the construction of means whereby these things can be done with less labour and greater efficiency; and I think I have succeeded in the attempt. The mechanism is simple, easily worked, inexpensive, and soon repaired when out of order, which it is not likely to be by fair means. It consists of a screw working on an axis supported by two iron uprights at the stern of the boat, and put in motion by means of a crank, on the axis of which a grooved wheel is fastened. Round this wheel a strap or chain passes to a smaller wheel which is securely fastened to the axis on which the screw is fixed. To the second iron upright from the stern of the boat, the rudder is attached, and both it and the crank are easily worked by one person standing on SIR,-I shall feel obliged by your allowing the

To the second iron upright from the stern of the boat, the rudder is attached, and both it and the crank are easily worked by one person standing on the deck, which projects sufficiently far to protect both screw and rudder from injury. The screw may also be turned by means of cog-wheels working upon each other, the smallest being attached to the axis on which the screw is fixed. I name this the "Hand Screw Propeller;" and, by means of which, I believe the barge, which must now not only wait for the tide to carry it on its journey, but every other description of craft must move out of the way for it, may, with the tide, be made to move at the rate of from six to eight miles an hour, and be readily moved out of the way of other vessels on the same water.

The barges on canals would, I hold, be greatly benefited thereby; their rate of speed would not only be increased, but the working may be done by one man, in place of, as now, employing a man, a boy, and a horse. To fishing boats, the addition of the "Hand Screw Propeller" would be a great advantage, especially during calms. It may also be advantageously employed in propelling and guiding at the same time small boats. At present, I do not know that anything of the kind has ever been invented, nor have I ever seen any description of barge or boat propelled in the manner I now propose to propel them. If it be an invention, the credit will be mine; but, whatever good there may be in it, or advantage drived from it, is now hereby given to the public, and should it be the means of promoting commerce, and lessening the labour of our watermen, I shall be repaid. I have made a working model, and any persons engaged in barge or boat building, or interested in their navigation, can inspect it by calling on me.— I am, Sir, yours, &c.,

Brunswick House, Tanner's Hill,

New Cross, London. I am, Sir, yours, &c., Brunswick House, Tanner's Hill, New Cross, London.

REVOLVING DISC BATTERIES FOR HARBOUR AND COAST DEFENCE.

SIR,—In order to avoid alluding to the subject in my next and concluding letter on the defence of fortresses,

<sup>\*</sup> Reported in the "American Railway Times."

permit me to state that since writing my ninth letter, in the which I alluded to a floating battery called as above, I have had an opportunity of seeing, in the house of an old friend of mine, in this city, in the designs of a circular floating structure invented by Mr. Elder, of Glasgow, and I have no doubt that anyone interested in the subject will, on perusing Mr. Elder's work, arrive at the conclusion that that gentleman's circular structures will, in steadiness, flotability, and shot-and-ram resisting strength possess a very great superiority.—I am, Sir, yours, &c., G. J. GUNTHER.

Bremen, December 22.

MINING ACCIDENTS.

SIR.—Your remarks in last week's issue, on the slowness of the mercurial barometer in indicating the danger which threatens the miner from a change in the density of the air, are very just and indisinthe density of the air, are very just and indisinthe density of the air, are very just and indisputable. Permit me to say that a quicker (because putable. Permit me to say that a quicker (because more visible) warning may be had from a water more visible warning may be the work, and if it be tap, it is quickly and easily set to work, and if it be refilled occasionally, its indications may be relied upon. A glass tube 3ft. 6in. long is required at the level of the oscillations; all the rest may be of iron or other tubing.—I am, Sir, yours, &c.,

SAMUEL HOROCKS.

### TO CORRESPONDENTS.

MEMECHANICS' MAGAZINE is sent post-free to subscribers
[£1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in
ivance.

of £1 1s. 8d. yearly, or 10s. 10d. man-yearly pages advance.
Alliterary communications should be addressed to the Alliterary communications should be addressed to the MECHANICS MAGAZINE. Letters relating to the dedvertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS MAGAZINE.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communitations unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

cations unaccompanies with the machine management of about 10 words. Woodcuts are charged at the same rate of about 10 words. Woodcuts are charged at the same rate of about 10 words.

RECEIVED.—B. H.—G. J. G.—O. G. and Co.—J. C.—
W. H. Le F.—J. E.—T. F.—C. G. R.—B. S. L. and Co.—
V. H. A.—C. C. J.—A. N.—R. T.—S. A. D.—R. P.—W. T.—
I. D.—S. H.—R. I.—P. M.—S. K. T.—W. R. T.—J. B. T.—
I. N.—E. S.—R. M.—J. B. K.—L. C.—J. W.—R. H.—W.
I. N.—E. S.—R. M.—J. B. K.—L. C.—J. W.—R. H.—W.
H. P.—C. D. R.—G. W. H.—T. W.—T. S.—G. W. H.—
H. P.—C. D. J.—J. R. and Co.—J. B.—W. T. F.
R. and Co.—D. J.—J. R. and Co.—J. B.—W. T. F.

## Meetings for the Meek.

TUES.—Royal Institution.—Professor Odling on "The Chemical Changes of Carbon" (juvenile lectures), at 3 p.m.

THURS.—Royal Institution.—Professor Odling on "The Chemical Changes of Carbon" (juvenile lectures), at 3 p.m.

SAT.—Royal Institution.—Professor Odling on "The Chemical Changes of Carbon" (juvenile lectures), at 3 p.m.

London Association of Foremen Engineers.—London Association of Foremen Engineers.—Annual Meeting, for the Election of Officers, &c. Mr. J. Newton, H.M. Mint, will deliver an Address, at 8 p.m.

## Habal, Military, and Gunnery Items.

A PINE steamer, of 1,000 tons burden and 300-horse A FINE steamer, of 1,000 tons burden and 300-horse power, was launched on November 30, at Trieste, from the shipbuilding yard of S. Marco. She was named the "Wassitai Tigiard," and is the property of the Sultan of Turkey.

A DISPATCH from Berlin says that, in a series of experiments which have recently been made in that crity the Catling battery gun has proved inferior to a

city, the Gatling battery gun has proved inferior to a

Prussian gun.

In addition to the targets constructed on the plans
In addition matter and Barnard, of the Engineer In addition to the targets constructed on the plans of Generals Totten and Barnard, of the Engineer Corps, of which trial has been made at Fort Monroe, a third target has been constructed in accordance with plans submitted to the Engineer Board by General Wright. This target was tried at Fort

Delaware.

The Royal Mersey Yacht Club has presented to the National Lifeboat Institution £75, being the mount of the proceeds of a ball held in the club-house, Liverpool, in aid of the great and national objects of the Institution. The committee of the society have expressed their high appreciation of this substantial mark of sympathy and support on the part of a club so capable of knowing the great value of the lifeboat work.

The two English steamers, "Norfolk" and "Collingwood," which were caught in the ice at Cronstadt and then cut a passage out into the open sea, after all the trouble and expense, were unable to get farther than the island of Seskar, where they found the Cronstadt, where they will now remain frozen in till next May.

next May.

The report of the secretary of the American navy exhibits the operations of that department and of the navy during the year. A considerable reduction of the force has been effected. There are forty-two of the force has been effected. There are forty-two which are established in different parts of the world. Three of these vessels are returning to the United Three of these vessels are returning to the United States, and four are used as storeships, leaving the States, and four are used as storeships, leaving the States, and four are used as storeships, leaving the States, and four are used as storeships, leaving the States, and four are used as storeships, leaving the States, and four are in use, armed with 696 guns. The total number of vessels in the navy 356 guns. The total number of vessels in the navy is 206, mounting 1,743 guns. Eighty-one vessels of every description are in use, armed with 696 guns. This with regret that we learn the death of Major-IT is w

### Miscellanea.

THE restorations of the Alhambra Court at the Crystal Palace being in a forward state, the Court Crystal Palace being in on Christmas Day.

rystal Palace being in a lot of the constraint of the most important towns of South-Barl, one of the most important towns of South-orn Italy, was lighted with gas for the first time on orn Italy, was lighted with gas for the street time on September 19. The number of public lamps was September 19. September 19.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending December 26, was 8,034. Total number since the opening of the Museum free daily (May 12, 1858), 1,456,567.

THE number of visitors to the South Kensington Museum on Saturday, including those to the Mayrick

THE number of visitors to the South Kensington Museum on Saturday, including those to the Meyrick armour and other galleries, was 20,629, being the largest Boxing Day's attendance yet registered at

armour and other galleries, wet registered at largest Boxing Day's attendance yet registered at largest Boxing Day's attendance yet registered at the turn-tables.

The number of visitors to the South Kensington The number of visitors to the South Kensington Museum during the week ending December 26, 1868, Museum during the week ending December 26, 1868, from 10 a.m. to 10 p.m., 24,609; on Wednesday, from 10 a.m. to 10 p.m., 24,609; on Wednesday, from 10 a.m. to 4 and Thursday (admission 6d.), from 10 a.m. to 4 and Thursday (admission 6d.), from 10 a.m. to 4 and Thursday (admission 73.3. Total from the tweek in former years, 12,373. Total from the tweek in former years, 12,373. Total from the tweek in former Freidrichshafen and Lake Constance, between Freidrichshafen and Romanshorn, is now about to be established; a knomanshorn, and knomanshorn, and knomanshorn and knomanshorn, is now about to be established; a knomanshorn, is now about to be establish

Island, is 4,000 to the runs parallel with the shore, is from 8tt. to 1st runs parallel with the shore, is from 8tt. to 1st runs parallel with the shore, is from 8tt. to 1st runs parallel with the shore, is from 8tt. to 1st runs death of 1st construction. The Government has appropriated 180,000 dollars for this improvement.

It is proposed to inaugurate a colliery insurance It is proposed to inaugurate a colliery insurance of the society, with a view of defraying the cost of accidents to property, and support the widows and childents to property, and support the widows and childents to provide for themselves. The premiums are to be fixed either according to the number of men emfieced either in the first a viving fact, says a New York paper, as provided either according to the number of the Inappears from the report of the Secretary of the Inappears from the report of the Secretary of the Inappears from the report of the Secretary of the Inappears from the report of the Secretary of the Inappears from the report of the Secretary of the Inappears from the report of the Secretary of the Inappears from the report of the Revolutionary soltions, there are at the present time on the ing a pension, there are at the present the fathers, or else they live longer.

The mothers of the Revolution were evidently reported the Revolution were evidently for younger than the fathers, or else they live longer.

The annual meeting of the members of the London The annual meeting of the members of the London of Hermanbury solties.

The annual meeting of the members of the London of Hermanbury solties.

The annual meeting of the members of the London well acquainted with the submarine structure of the followed by the election of officers for 1869, and the followed by the election of officers for 1869, and the followed by the election of officers for the past half presentation of the balance shee

was hardly possible, as the constantly-recurring shocks were very violent. It is supposed that ther were no loss than forty shocks, and some were fewered they then days of the theory of the constant of the standard of the for more than two days after the occurrence of the

first.

DURING the late and recent gales droves of DURING the late and recent gales droves of sorpoises have made their appearance in the river. On Sunday afternoon three of them were disporting themselves near London Bridge; some boats ing themselves near London Bridge; some boats to the crews in pursuit dislodged them, and later in the crews in pursuit dislodged them, and later in the crews in pursuit dislodged them, and later in the crews in pursuit dislodged them, and later in the crews in pursuit disloged them.

where he was shot, and measured (2) where he was shot, and measured (2) in.

THERE appears to have been no authentic bust or other portrait of Beethoven in existence, and a study of the portrait of Beethoven in existence, and a study of the producing one. He collected all the existing task of producing one. He collected all the existing task of producing one. He collected all the existing task of produced sees, consulted several persons who pseudo-likenesses, consulted several persons who pseudo-likenesses, consulted several persons who produced a most remarkable work, full of fire, genius, and character.

pseudo-likenesses, consulted several persons who had known or seen the famous author of the "Pastoral Symphony," studied the man in his works and his biographies, and is said to have your and his biographies, and is said to have your and his biographies, and is said to have your and the latent of the past month (November), the progress made at the Mont Centis tunnel was 62:10 metres, of which 32:40 metres of which 32:40 metres were driven at the Italian side, and 29:70 metres on the French side. The position of these works up to the 30th November of which 32:40 metres of the side of the

public wel ?

The following extraordinary illustrations of prolonged existence appeared in the obituary of the a Times" of the 23rd ult., where the deaths of six ladies are recorded whose united ages amounted to 519 years, giving an average of exactly 86 years and and 6 months to each. Their respective ages were two at 83, one at 84, one at 85, one at 91, and the oldest had reached the great age of 93. The same obituary recorded the death of a gentleman at 90 years of age, which, added to the above total, would give an average of exactly 87 years to each of these seven persons. A medical practitioner in this metropolis recently stated that he had just seen ten patients whose ages averaged 87 years and 10 months each.

### Watents for Inbentious.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES-1888, 1890, 1904, 1936, 1939, 1942

UILDINGS AND BUILDING MATERIALS-1899, 1903, 1907, 1981

1981
CHEMISTRY AND PHOTOGRAPHY—1885, 1909, 1912, 1920, 1940, 1945, 1953, 1954, 1972, 1974
CULTIVATION OF THE SOIL, including agricultural implements and machines—1893, 1941, 1943, 1963, 1975, 1982
ELECTRICAL APPARATUS—None
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—1910, 1913, 1923, 1932, 1946, 1956, 1957, 1960, 1964, 1968, 1976, 1975, 1979
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—1944, 1970
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—1836, 1887
GRNERAL MACHINERY—1898, 1911, 1914, 1915, 1924, 1926,

SIME-RECEPETS, Jewellery, musical instruments, &c.—1886, 1887.
GRNERAL MACHINERY—1898, 1911, 1914, 1915, 1924, 1926, 1927, 1937, 1984, 1986, 1987, 1989.
LIGHTING, HEATING, AND VENTILATING—1902, 1948, 1980.
METALS, including apparatus for their manufacture—1892, 1921, 1922, 1977.
MISCELLANEOUS—1884, 1889, 1891, 1895, 1896, 1897, 1900, 1901, 1905, 1908, 1916, 1917, 1919, 1925, 1929, 1933, 1935, 1935, 1951, 1952, 1959, 1961, 1962, 1965, 1971, 1985, 1988, 1991.

1991
ROADS AND VEHICLES, including railway plant and carriages. saddlery, and harness, &c.—1905, 1947, 1955, 1958, 1966, 1967, 1968, 1973, 1969
SHIPS AND BOATS, including their fittings—1928, 1990
STEAM ENGINES—1918, 1934, 1938, 1933
WARFARE—1894, 1931, 1950

1884 A. MUNBO. Arbroath. Forfar, and W. B. ADAMSON, Glasgow, N.B. Manufacturing tools for hewing or cutting stone. Dated June 9, 1868.

This invention, in the first place, relates to a new method of manufacturing tools to be used for the purpose of hewing or cutting stone, slate, marble, and other substances, and it consists in the manufacture of such tools in a direct manner, so that, when made by this method, they are at once fit for use. The invention relates, in the second place, to the employment of metallic compounds or alloys, as the material of which such tools are formed.—Patent

abandoned.

1885 J. H. JOHNSON, Lincoln's Inn-fields. Treatment of oxide of iron. (A communication). Dated June 9, 1888.

According to this invention, it is proposed to mix the powdered oxide of iron (obtained from the calcination of iron pyrites) with small coal, and to agglomerate the mass by the addition thereto of tar, the whole being pressed into bricks or blocks by suitable machinery, such as is employed in the manufacture of artificial fuel.—Patent abandoned.

abandoned.

1886 G. DAVIES, Serle-street, Lincoln's Inn-fields.

Lounging chairs. Dated June 10, 1868.

The patentee claims, first, the particular arrangement of the ironwork for producing the inclination of the back and other movable parts. Second, the improved mechanism for fixing the lounging chair at any desirable inclination. Third, the arrangement of the plank for supporting the feet or raising the leg cushion at will; and, fourth, the general improved arrangement of the various parts with regard to each other for increasing the case and comfort of the occupant.—Patent completed.

1887 P. Fraye, Walbrook, City. Harmoniums. (A communication). Dated June 10, 1868.
Hitherto organs or harmoniums with free valves have not proved satisfactory, either to the performer or to the auditors, the system in use up to this day giving a marked predominance to the base over the upper scale. This system obviates all difficulties hitherto met with in the construction of the above instruments.—Patent abandoned.

1898 W. FERRIE, Monkland Iron and Steel Works, Lanarkshire, N.B., Smelting or blast furnaces. Dated June 10, 1868.

This invention is not described spart from the drawings.

—Patent completed.

Patent completed.

1889 J. T. LADYMAN, Rochdale. Apparatus for working wood. Dated June 10, 1868.

This invention consists, mainly, in an improved construction, combination, and arrangement of various tools or cutting instruments for working wood in one and the same machine, and refers more particularly to that description of machine known as the "general joiner." The invention comprises much detail, which we cannot produce here.—Patent completed.

1890 W. HAMER, Bowden, and J. DAVIES, Runcorn, Cheshire. Furnaces of sail pans. Dated June 10, 1868.

This invention consists in substituting for that part of the brickwork liable to be affected by the fire vessels, which the patentees prefer to be of wrought-iron plates, riveted or welded together, and so constructed that they may be filled with water. This water prevents the iron plates from being burnt by the fires, and when heated or converted into steam, it may be used for heating other pans, or for other purposes.—Patent completed.

1891 J. Carter, Strand. Portable closet. Dated June 10,

1891 J. CARTER, Strand. Portable closet. Dated June 10,

1891 J. CARTER, SURBLE.
1868.
This invention consists in constructing the seat of or for a commode or water-closet in pieces, and hinging or jointing them together, so that they may fold or pack into a small compass.—Patent abandoned.

1892 C. W. SIEMENS, Great George-street, Westminster.

Manufacture of cast steel. Dated June 10, 1868.

This invention relates to a previous patent granted to the present patentee, dated August 21, 1867. The details of the invention are too voluminous to admit of our quoting them here.-Patent completed.

them here.—Patent completed.

1893 J. and E. Firth, Belfast. Reaping and moving machines. Dated June 10, 1863,
These improvements have for their special object to obviate the necessity of using a crank or cranked shaft for giving motion to the knife bar, the irregularity of the motion imparted through the crank speedily deranging the working parts of the machine, and not unfrequently breaking the knife bar.—Patent abandoned.

1894 C. E. BROOMAN, Fleet-street. Breech-loading five-arns. (A communication). Dated June 10, 1868. This invention is not described spart from the drawings.—Patent abandoned.

-Patent abandoned.

1825 A. M. Clark, Chancery-lane. Pipes used for smoking. (A communication). Dated June 10, 1868.

The patentee claims, first, the application to pipes of an imitation lighted eigar, for the purpose of simulating a cigar and holder. Second, he claims the particular arrangements and mode of filling the artificial eigar to the pipe, for the purpose of removing it when desired, as described.—Patent completed.

pipe, for the purpose of removing it when desired, as described.—Patent completed.

1896 H. A. Bonneville, Sackville-street, Piccadilly. A new and improved apparatus for shuffling and dealing cards. Dated June 10, 1883.

This invention relates to a new and improved apparatus for shufling and dealing cards, and consists in a box made of wood or any other material combined with a clockwork movement. This box having the width or thereshouts of a pack of cards twice its length, and about three times its thickness, is divided at the middle transversely by several steel or copper wires, fixed in its sides at a certain distance from one another. The cards being put into the box furnished with a lid, are shaken in the direction of its length, and are thus shuffled by being divided and separated by the transversal metal wires. The shuffling of the cards being effected by inclining the box, and pressed towards the upper part thereof, by means of a spring placed at the bottom of the box, and which is set free by the hand against a cork or wooden roller, covered or not with cloth or caoutehout. This roller receives a rotation movement from the clockwork placed in an envelope fixed in the upper extre nity of the box by means of ordinary gearing, and this rotation has for its object to carry away and in succession push outside all the cards through an opening or slot at the end of the box.—Patent completed. -Patent completed.

1397 E. P. J. L. FERREL (des Chenes), Villie-Morgon, France. Apparatus for heating wine, &c. Dated June 10,

This invention is not described apart from the drawings.

This invention is not described apart from the drawings.

Patent completed.

1898 W. F. PROCTOR, Glasgow. Embroidery apparatus to be applied to seeing machines. (A communication). Dated June 10, 1868.

This invention relates to the application to sewing machines of the ordinary construction of automatic apparatus, by means of which braiding threads may be lapped around the vertical needle, and made to cross each other in such numerates the way when the described in the contraction of other in such manner that they may be held down on the face of the fabric to be ornamented by means of the stitches formed by the needle thread. The arrangement admits of modification.—Patent completed.

admits of modification.—Patent completed.

1899 W. Barton, Boston, Lincoln. Kitchen ranges. Dated June 10, 1868.

The patentee claims, first, the several arrangements of parts set forth and described, comprising an open fire-place, with one or more boilers and ovens, so arranged as to economize and use the heat given off from the fuel, Second, constructing the boilers with outside vertical tubes communicating with the top and bottom of the boilers, and which tubes being contained in the flue space by the side of the boilers, will receive heat from the gases and flame arising from the fire, and will materially assist in heating the water in the boilers. Third, he claims constructing the ovens with internal flue tubes, for the passage of the heated gases, as set forth. Fourth, forming openings from the space above the range communicating by suitable flues with an annular space surrounding the smoke plpe, for the purpose of carrying off any effluvia or vapours arising from the cooking, and conducting them into the chimney, as set forth.—Patent completed.

1900 C. R. E. Grund. Bow-lane, Cannon-street, London.

into the chimney, as set forth.—Patent completed.

1900 C. R. E. GRUBB, Bow-lane, Cannon-street, London.

Match bor. Dated June 10, 1868.

The box may be formed of thin metal, but, by preference, the inventor makes use of paper or pasteboard. Supposing the body of the box to take the form of a round or oval tube (which will commonly be the shape he employs), he closes opposite ends of the tube by fitting thereto hinged lids, which lids will lie flush, or nearly so, with the periphery of the tube, and he ensures the closing of the lids by connecting them together internally by a band of india-rubber compound. The tension of the rubber will keep the lids closed, and yet allow of access to the box at either end, which will be a great convenience when the box is used for carrying double-ended fuzees. Friction surfaces for the ignition of matches may be prepared on one or both of the lids of the box.—Patent completed.

1901 T. E. Williams, Newport, Monmouthshire. Pots

one or both of the lids of the box.—Patent completed.

1901 T. E. WILLIAMS, Newport, Monmouthshire. Poise employed in the manufacture of tin and other plates. Dated June 10, 1863.

This invention consists in the peculiar shape or formation of the annealing pots, whereby their strength and durability are greatly increased without adding materially to their weight or cost. Instead of making the improved pots square or rectangular in their cross section with straight sides, as such pots have hitherto been constructed, the patentee makes them with curved corners, or with curved sides and corners, the interior of the sides being either convex or concave, according to the nature of the work for which the pots are to be used. The said pots may be constructed of iron, clay, or other suitable material.—Patent completed.

1902 W. H. WESTWOOD. Dudley. Wor cester. Gasholders.

coating or covering with lead, or an alloy of lead, the wrought or east from of which the said gasholders, gas purifiers, and apparatus are made, so as thereby to protect the said wrought or east from from the corrosive action of the sulphur and other matters contained in the gas. The invention consists, second, in the methods of forming the joints of gasholders and apparatus used in the manufacture and distribution of illuminating gas, composed of plates or sheets of iron.—Patent completed.

ture and distribution of illuminating gas, composed of plates or sheets of iron.—Patent completed.

1903 H. Turner, Leeds. Construction of privies, ashpits &c. Dated June 11, 1863.

The fecal matter is collected in a cistern made, by preference, of glazed fireclay, or carthenware, and the urineis conducted by spouts or otherwise into the space beneath the cistern, into which space the ashes are also collected one end of the cistern is provided with a sliding door oraping, and the cisterns are placed so much above theleve of the street or road that the contents may be drawnout by a scraper or otherwise, and collected in a suitableur or vessel. The ashpit is not required to be emptied at the same time as the cistern, as the contents of the cistern are kept separate from the contents of the ashpit. The whole system of privies and ashpits are shut up by a large door, which is only opened by the night soil men, when the cisterns or the ashpit are to be emptied. When the large door is open, the cart or vessel to collect the feeal matter is backed in under the end of the cistern, a small door in the large door giving access to the privies. The privies are ventilated by lines carried from the back of the seat, and taken up to the top of the chimney, or to any convenient part of the building.—Patent completed.

1904 S. Barlow, T. Edmeston, and T. Beeby, Stokehill, near Manchester. Furnaces for steam boilers, &c. Dated

1904 S. Barlow, T. Edweston, and T. Beebt, Stokehill, near Manchester. Furnaces for steam boilers, &c. Dated June 11, 1868.

The furnace consists of two sets of gratebars, the upper set being tubular, and containing water, as described in the specification of letters patent granted to S. Barlow and T. Edmeston, on April 11, 1867 (No 1078), and the lower set is of the usual construction, or tubular, with water passing through them. The tubes of the upper set of gratebars are connected to front and back water chambers, the front one being connected by a pipe or pipes to the lower part of the boiler, and the back one by a pipe or pipes or a water pocket to the upper part of the flue. A bridge is placed above the upper set of gratebars, and another at some distance apart below the same. By this arrangement the products of combustion from the fuel, which is placed chiefly on the top set of gratebars, are drawn down and ignited by the fuel on the lower set of gratebars, and they then rise again through the top set, and then pass over and under the back water chamber to the flue. The water is caused to circulate through the hollow gratebars by the action of the pre-ducts of combustion on the pipe or pipes or water pocket connecting the backwater chamber to the top of the flue.—Patent completed.

1905 W. UNSWORTH, Paris. Sail brake. Dated June 11,

1868.

The patentee claims the employment of a sail brake for stopping trains, either to be used singly, or in conjunction with those now existing, such sail being raised or lowered by means of chains or cords, either by aid of one or more screws, and winged nuts, as described, or by means of a drum and angle toothed pinions, in the manner and for the purposes set forth.—Patent completed.

the purposes set forth.—Patent completed.

1906 J. Rodgers, Hunslet, near Leeds. Bands for driving machinery. Dated June 11, 1863.

The objects of this invention are, first, to produce driving belts, straps, or bands of greater strength and lightness than those in ordinary use. Second, to avoid the annoyance arising from the stretching of ordinary belts when in use; and, third, to obviate the necessity of stretching new belts before use. The inventor accomplishes those results by several means.—Patent abandoned.

1907 A. M. CLARK. Chancery-lane. Bricks' for building, &c. (A communication). Dated June 11, 1868.

This invention relates to improvements in the manufacture of bricks or slabs suited to building purposes from the dross of blast furnaces combined with hydraulic and other limes, cements, or plaster, and it consists in a mode of reducing the dross to a line granular condition by plunging it into water while still in fusion and inean descent, by which means the dross is reduced to a fine sand suited to the purpose required.—Patent abandoned.

1908 S. J. Paris, W. H. Drummond, and D. Hamer,
Manchester. Values. Dated June 11, 1868.
This invention relates to valves which open and close to
control the passage of liquids or fluids, and is designed
for the purpose of diminishing or removing the pressure on
the realings or frictional surfaces of the said valves.—
Patent abandoned.

1909 E. A. SOUTHBY, Lanark. Utilizing eleaginous acid seasts. Dated June 11, 1868.

This invention has for its object the utilizing of the acid waste which is deposited or precipitated on treating any hydrocarbon oil with sulphuric acid, and which acid waste is also sometimes termed acid tar, and pitch, or acid sludge. And the invention consists in suitably heating the waste so as to throw off the sulphur compounds in the form of sulphurous acid gas, which may be used as such, or be converted into sulphuric acid in the usual way—Patent abundoned.

1910 W. Havangeon, C.

abandoned.

1910 W. HENDERSON, Glasgow. Apparatus for finishing woren fabrics. Dated June 11, 1868.

This invention relates to apparatus for finishing woven fabrics of the kind in which the fabric is held, by its edges, upon two endless chains, arranged to carry it through the apparatus, and actuated, in some cases, so as to impart an oscillatory or intermittent movement to the fabric, whereby what is known as the elastic finish is obtained. The invention relates, more particularly, to the holding details, and consists in thing the improved holders or clips directly down upon the top of the links composing the endless chain.—Patent completed.

being either convex or concave, according to the nature of the work for which the pots are to be used. The said pots may be constructed of iron, clay, or other suitable material.—Patent completed.

1902 W. H. Westwood, Dudley, Wor cester. Gasholders, &c. Dated June 10, 1868.

This invention consists, first, in so making or arranging seeing machines that the patentees combine the main cam with the flywheel, and means for imparting foot or services and motion to the same, the combined cam and flywheel working at right angles with a bar that carries the shuttle, and which said bar is actuated by the cam on the periphery of the flywheel, and is supported in its work by a strong of gas for illumination. The invention consists, first, in



frame or body, and top arm of the machine, the said shuttle bar carrying the shuttle as before stated, rendering a shuttle mace unnecessary. The bed bar before referred to they purpose euclosing with a piece of drawn or other tube, which may be of any desirable section, or otherwise, to suit various hands or description of work. Second, the improvements relate to the tension and means of regulating the same, which consists of a thin disc of metal serrated or divided around its edge, each divisional part being alternately spread outwards, so as to form a groove for the thread to ride on, and the serrated disc moves on an axis supported in its rectangular position by a washer, front and back, and regulated by a screw and spiral or other spring, the presence of which against the front washer regulates its action. Third, in applying indiarubber around the groove of sewing machines and driving wheel of the machine stand in which the gut or cord works for the purpose of deadening the sound, as well as for the advantage of its contraction and expansion, and adhesion to the gut or cord while at work. And, lastly, the general combination.—Patent completed.

1912 W. E. NEWTON, Chancery-lane. Cement\_applicable to china, &c. Dated June 11, 1868.

To make the cement, take, say, one pound of white glue which soak in soft water till the glue is dissolved, then add 41b. of izinglass, and 40z, of pulverized gum arabic, 40z, of gum tragacanth dissolved in water, 60z, of white lead, 40z, of bleached gum shellac dissolved in alcohol; after which should be added half a pint of alcohol, and 10z, of best glycerine. The cement or mixture thus produced should be bottled while warm, and the bottle afterwards suitably corked or stopped.—Patent abandoned.

suitably corked or stopped.—Patent abandoned.

1913 J. Lord, Crawshaw, Booth, near Ravenstall, Lancashire. Applying soap, oil, or similar materials to cotton scool, &c. Dated June 11, 1868.

The patentee is aware of revolving rollers having been previously used for the purpose of oiling fibrous materials, and he therefore lays no claim to rollers generally, but he claims, for the purpose aforesaid, the use of a roller partly immersed in the fluid, and taking the said fluid upward to the section of the revolving distributor.—Patent completed.

1914 A. E. G. THENARD, Leicester-square. Apparatus for effecting the combustion of fuel. Dated June 11, 1869. The great length of this invention precludes our quoting it here at sufficient length for an intelligible abstract.—Patent abandoned.

Patent abandoned.

1915 F. WARNER, Jewin-crescent, London. Obtaining scater. Dated June 11, 1868.

The inventor forms a bore hole in the earth, and lines it with a light metal tube in the usual manner, taking care that the earth is closely rammed in around the lining tube at the top. Within the lining tube he inserts a pipe reaching to the bottom of the hole, or nearly so. He prefers that the pipe should terminate a short distance above the water level in the bore hole, so that the first action of the pump may be partially to exhaust the air in the space between the lining tube and the inner pipe; thus an imperfect vacuum is formed which tends both to suck water in to the bore hole, and to aid the pump in its further action. An air-tight joint is made between the lining tube and the pipe, at or near the top of the lining tube and a pump is connected with the Interior pipe, which is thus the suction pipe of the pump.—Patent abandon.d. pipe, which **abandon**ed.

1916 T. MORRIS, Regent-street. Buovs. Dated June 11

1808. The inventor proposes to make floats or vessels possessing considerable buoyancy, and to partially immerse or totally submerge the same as may be necessary for affording supports to objects for erections in or above deep water. He proposes to effect partial or total submergence by the use of cables, chains, rods, or other means connecting the buoyant vessels with weights, anchors, or fastenings resting upon or affixed to the underlying rock or water bed. The main body of the buoyant vessels being kept below the level of more active agitation, would be sufficiently at rest to afford stationary support to objects and erections of comparatively small sectional area, rising to or above the surface of the water, and the degree or quantum of support would be that of the ascensive power of the immersed or submerged vessel or its resistance to further depression.—Patent abandoned.

1917 A. S. STOCKER. Horsleydown, Surrey. Infants'

ance to further depression.—Patent abandoned.

1917 A. S. STOCKER. Horsleydown, Surrey. Infants' feeding bottles. Dated June 11, 1868.

One portion of this invention relates to producing caps or covers out of certain kinds of metal or alloys of a yielding unridged pliant nature, say, block tin, pewter, Britannis, or such like metal, as will readily conform to and receive screws or their equivalents provided thereon or therein by external and internal pressure by the aid of an india-rubber mandril or plug, the plug being in combination with internally screwed dies or natrices made in two parts, and to follow each other with a view to facilitate the release of the caps or covers therefrom, after they have been shaped, as well as for operating upon them with greater rapidity.—Patent completed.

1918 F. D. LA CHASE. Worship-street, Loudon,

greater rapidity.—Patent completed.

1918 F. D. LA CHASE. Worship-street, London.
Governors for steam and other engines. Dated June 12, 1868.
This invention consists, chiefly, in the novel construction and arrangement of the parts of an engine governor, whereby the work of governing and closing the throttle valve is entirely effected by the engine, which, at the same time, is completely under the control of the governor. The latter being relieved from the resistance offered by the friction, and weight of the valve and spindle, is rendered more sensitive to slight variations in the speed of the engine, whose motion is thereby rendered more regular and uniform than has hitherto been practicable.—Patent abandoned.

1919 J. H. JOHNSON Lincoln.

Patent abaudoned.

1919 J. H. JOHNSON, Lincoln's Inn-fields. Miners' safety cages. Dated June 12, 1868.

This invention relates to certain peculiar combinations or arrangements of mechanism for arresting miners' safety cages, lifts, or other like hoisting apparatus, in their descent when the hoisting rope or chain breaks, and consists, essentially, in bringing into action the arresting mechanism of the cage or lift by means of a counter weight in connection with the mechanism by which the cage or lift is arrested in substitution for springs.—Patent completed.

1920 A. L. Herry Tarana.

1920 A. L. HENRY, Trafalgar-square, Charing Cross.
Treating quarts, &c. Dated June 12, 1868.
This invention consists in converting silica or silicates (such as are found in nature, and such as had been produced.

artificially) into sulphide of calcium, by treating them in the way described, with sulphur or compounds of sulphur, and then in treating the sulphide of silicium with water or steam, whereby the sulphide is decomposed, and the silicium converted into a hydrate of silica which is soluble in hot water and is ready for use in the arts and manufactures, as described.—Patent abandoned.

factures, as described.—Patent abandoned.

1921 A. L. FLEURY, Trafalgar-square. Apparatus for treating gold and silver over. Dated June 12, 1868.

This invention consists in mixing powdered gold or silver ore with a proportionate quantity of fluoride of calcium, natural or such as is artificully prepared, or of any other fluorine salt or acid, and exposing this mixture to the combined action of steam and carbonic acid. A decomposition of the mineral results, and a milky solution is obtained from which the mechanically suspended gold is abstracted by passing the liquid through a bath of mercury, or other suitable menstraum. The refuse mineral solution is used as a cementing liquid or base for paint in the way and for the purposes described.—Patent abandoned.

abandoned.

1922 J. Gray and R. Weir. Glasgow. Treating ore. Dated June 12, 1868.
This invention has, principally, for its object the obtaining of steel from iron ores, and from crude metal, but it is also applicable for obtaining from their ores copper, tin, and lead, or for refining these metals. The invention comprises certain means for driving off phosphorus, sulphur, silicon, boron, and other impurities, in a more effectual and economical manner than heretofore.—Patent completed.

1923 J. Anderson, Ramsbottom, Lancashire. Machinery employed for preparing and spinning hard waste or cop-bottoms. Dated June 12, 1868. This invention relates to the preparation of hard waste

This invention relates to the preparation of hard waste which the inventor obtains in continuous carding by dividing the doffing cylinder into two or more spaces forming endless belts of cards on the said cylinder (instead of dividing the cards across the periphery and stripping endwise, as heretofore practised). The cardings pass from the doffer and are received by rollers and coilers into the can motion end can.—Patent abandoned.

1924 G. DAVIES, Serie-street, Lincoln's Inn. Cranca. A communication). Dated June 12, 1868. This invention is not described apart from the drawings. Patent completed.

—Patent completed.

1925 L. and A. PYKE, Holborn. Shirt studs. Dated June 12, 1868.

Here the inventors propose, in lieu of the ordinary back of the stud, that at the end of the neck of the stud or button a back shall be fixed, so as to fold down or lie against the neck on hinges or movable joints, so that, when required to pass through the hole of a shirt or buttonhole, the two halves forming the back may fold down, and after passing through to open flat, and thus form a back, and securely fix the stud in its place.—Patent abandoned.

1925 I W CUTNORE Holloway. American for cooling.

securely fix the stud in its place.—Patent abandoned.

1926 J. W. CUTMORE, Hollowsy. Apparatus for cooling liquids. Dated June 12, 1868.

The stret part of this invention consists in the construction of refrigerators particularly applicable to the cooling of liquids generally, such as water, wines, &c., but more especially to the cooling or Icing of beer as it is drawn from a beer engine. The second part of the invention consists in uniting the pipes or tubes for supplying the apparatus with liquid, or for withdrawing it therefrom, by means of a metal clip slipped over a piece of flexible tubing passing over the ends of the pipes to be joined; the said clip is provided with flanges which are pressed together and held by a nut or screw, so that the clip holds the flexible tubing securely to the pipes.—Patent abandoned.

1928 N. D. SPARTALII, Liverpool. Apparatus for burning

1928 N. D. SPARTALI, Liverpool. Apparatus for burning ydrocarbon oils. (A communication). Dated June 12,

This invention is not described apart from the drawings.

Patent completed.

3637 W. R. LAKE, Southampton-buildings, Chancery-lane. Anchors. (A communication) Dated June 12, 1868.

This invention has for its object the construction of an anchor which shall be cheap and useful, and which may be easily stowed, and can be made to occupy but small space when not in use, while, from its peculiar construction, in whatever way it may fall on the ground or bottom, one or both arms or flukes will immediately take and hold. These objects are accomplished by placing the arms or flukes in longitudinal openings in different portions of the shank, and at right angles to each other, so that the arms or flukes may swing out on either side by gravitation as the anchor falls, while, when not in use, they lie within the body of the shank.—Patent completed.

1929 S. S. Bent, Porchester, New York, U.S.A. Poultry

1929 S. S. BENT, Porchester, New York, U.S.A. Poultry houses or coops. Dated June 12, 1868.

The object of this invention is to make the coop or house, the nests and the feeding pans, wholly or partially of iron, in such a manner as to ensure cleanliness and freedom from the lice and vermin usually found upon chickens and other poultry, and at the same time to protect the poultry from rats, foxes, and other animals.—Patent abandoned.

abandoned.

1930 C. ROSTAING and E. VIVET, Paris. Material suitable for making steam, water, and gas-tight ioints, &c. Dated June 12, 1868.

This invention has for its object an improved material suitable for making water and gas-tight joints, and for similar uses. The patentees take two sheets of wire cloth, of any suitable dimensions and metal, such as iron, copper, or brass; they place between them a sheet of lead, and pass them together through rollers, so as to press the wire cloth into the substance of the lead, and thus form of the whole one and the same body; other suitable means may be resorted to for combining the wire cloth and the lead. The material thus made is placed and passed between the parts or junction of any apparatus for suctaining pressure, such as steam, liquid, or gas pressure, and for preventing the egress or ingress of such steam, liquid, or gas,—Patent completed.

1931 W. RICHARDS, Birmingham. Breech-loading fre-

liquid, or gas.—Patent completed.

1931 W. RICHARDS. Birmingham. Breech-loading frearms and projectife. Dated June 12, 1868.

The patentee claims, as respects one part of the invention, the constructing breech-loading firearms, in which
the breech is closed by a block turning on an axis at right
angles to the bore, the arranging the parts of the lock
within such block and in such manner that the movement of the lever handle to open the breech "cocks" the
lock, or prepares it for the discharge of the piece. He
also claims in such firearms the arranging the extractor

to receive its outward movement from a finger carried by the breech-block on a spring stem, so that the finger is able to pass the nib of the extractor in closing the breech by the outward yielding of the stem. He claims, as respects another part of the invention, in firearms in which the breech is closed by a block turning on a horizontal axis at its breech end, the combining a striker and apparatus for actuating the striker with such block, so as to adapt the gun to receive central-fire cartridges carrying their own priming. He also claims in such firearms the mounting the tumbler within the body or frame on the same axis with the breech-block, and the arranging the hand lever which actuates the breech-block, so as also, in opening the breech, to draw down the tumbler and cause the striker to recede. The specification includes much detail, reference to the drawings being necessary for a full description of the drawings.—Patent completed.

1932 C. HUMFREY, Southwark. Flexible compound appli-tible to waterproofing and other purposes. Dated June 13,

In the manufacture of stearic acid from neutral oils and In the manufacture of stearic acid from neutral oils and fats by what is known as the acid process, a large quantity of residuary pitch remains in the stills after the volatile fatty acids have been distilled over. Each different oil or fat, when submitted to the acid process before mentioned, will leave a different residue, though all similar in chemical residues may be employed for the purposes of this invention, but the inventor prefers the pitch resulting from the acidification and distillation of palm oil. To render these products or pitchy residues fiexible and soluble in any ordinary solvents, such as turpentine, naphtha, petroleum, or coal oil spirits, or mixtures of the same, he mixes them with the residuary pitch obtained in the distillation of the crude oil or tar obtained from Boghead and other oil-producing coals. Any of these may be used with success.—Patent abandoned.

1933 J. Toft, Mauchester. Lathes for turning, &c. Dated

1933 J. TOFT. Mauchester. Lathes for turning, &c. Dated

1933 J. Toff, Mauchester. Lathes for turning, &c. Dated June 13, 1868.

The object of this invention is the construction of lathes for turning or manufacturing in an automatic manner, from sticks, rods, or blocks inserted in the lathe, articles or bodies of regular and irregular forms, including wooden boxes, thread spools or bobbins, tassle moulds, and other articles or bodies of a bollow or solid character, and the invention consists in means and arrangements for effecting this object.—Patent completed.

1934 C. H. MITCHELL, Barhead, Renfrew. Steam engines. Dated June 13, 1868.

This invention has for its object to construct and work

This invention has for its object to construct and work

1934 C. H. MITCHELL, Barhead, Renfrew. Steam engines. Dated June 13, 1868.

This invention has for its object to construct and work steam engines in an improved manner with the view of economizing fuel. The principal feature of novelty is a peculiar mode of combining a high pressure cylinder and a low pressure cylinder with one port face, so that one valve may serve both cylinders, and so that the expansion of the steam which is admitted directly from the boiler to only one end of the high pressure cylinder may be carried to an unusually great extent without the great variation in the strain on the crank shaft associated with ordinary modes of working very expansively—Patent abandoned.

1935 C. Whitehous, Bridgtown, near Cannock, Stafford. Bering bits and augers. Dated June 13, 1868.

This invention consists in making boring bits and augers of a forked-shaped frame or hollow barrel, open on opposite sides, the said frame or barrel being either parallel or taper, and providing the nose or acting end of the said frame or barrel with a helical blade or cutting edge, or helical blades or cutting edges, and either with or without a central worm or point, or leading point, whether the said nose end be convex, flat, or pointed (substantially as described and illustrated). Also in making the boring bit or auger of a half forked frame or barrel, with a helical blade or cutting edge at the nose end, and either with or without a central worm or point (substantially as described and illustrated)—Patent completed.

1936 W. and J. Mackie, Kilbornie, Ayr, North Britain. Steam boilers. Dated June 13, 1868.

This invention consists in forming the flue division at the rear of the boiler of one or more auitably shaped metallic vessels or chambers, in place of a brick wall, as as usually constructed. The feed water is forced by the feed pump through a pipe placed in the flue, and connected to each of the chambers near the bottom. Another pipe is placed over the top of the chamber or chambers and connected to each of the chambers n

1937 W. MULLER and G. ENGLERT, Earl's-court, London.

Apparatus for cooling beer, &c. Dated June 13, 1868.

This invention is not described apart from the drawings.

-Patent completed.

Patent completed.

1938 J. Howden, Glasgow. Steam or other motive power engines. Dated June 13, 1888.

This invention consists, chiefly, in new methods and arrangements for working the valves of steam or other motive power engines, by which the power usually expended in giving motion to the valves is greatly reduced, and the action of the steam, air, gas, water, or other fluid in the cylinder rendered more effective. These improved arrangements are also combined in some cases with a regulating movement in connection with the governors by which a uniform speed is maintained by varying the admission of the steam, air, gas, water, or other fluid in proportion to the amount of work to be done. The invention is not described apart from the drawings.—Patent completed.

1939 W. YATES, Duke-street, Westminster.

Patent completed.

1939 W. YAES, Duke-street, Westminster. Furnaces to be used in metallurgic operations. Dated June 13, 1868.

This invention relates more particularly to those furnaces in which iron and steel are operated upon, and consists in constructing such furnaces, or protecting their inner surfaces, by lining in such a manner that they will be better able to resist the great heat to which such furnaces are exposed in metallurgic operations. In constructing a new furnace, say, a rotary puddling furnace, the inventor forms the cylinder of a suitable number of wedge-shaped bars of malleable cast iron, steel, or wrought iron, which are secured in their place either by being placed inside a casing made of sheet iron, or by means of metal bands or rings, or in any other convenient manner or the wedge-shaped bars may be attached or fixed to end



plates made of malleable cast iron or steel, in which are nade openings for obtaining access to the interior of the ylinder.—Patent abandoned.

oyinder.—Palent abandoned.

1940 K. MALSTER, Pall Mall, Westminster. Compound for cleaning gloves. Dated June 13, 1868.

This mixture or compound is made by immersing fatty acid, dry soda, and chloride of sodium, in water for about thirty-six hours, by then bringing the mixture (by a grinding mill or otherwise) to the consistence of cream or paste, by then adding spirits of wine, and, finally, submitting the mixture a second time to the action of the mill.—Patent completed.

1941 J.T. PARLOUR, Pimlico. Elevators and apparatu for shorelling, raising, and conveying grain, &c. Dated June 13, 1868.

This invention is not described apart from the drawings -Patent completed.

-Patent completed.

1942 P. H. DENNIS, Chelmsford. Horizontal tubular boiler. Dated June 13, 1868.

This invention has for its object improvements in the construction of boilers for the purpose of heating hot water pipes or other surfaces, and consists of a series of cast or wrought iron, or other metal tubular rings, with blocks, sockets, flanges, or other connections at one or more points, by which the tubular rings may be tatached to each other, so that any number of rings may be readily put together to form one boiler, each tubular ring being, by preference, wrought, formed, or cast separately; but, if it should appear more desirable, the whole, or any two or more parts, of the said boilers, which are in the specification described as a separate section or portion, may be wrought, formed, or cast in one piece.—Patent completed.

1943 W. R. LAKE Southamnton-buildings Chancery.

wrought, formed, or cast in one piece.—Patent completed 1948 W. R. LAKE, Southampton-buildings, Chancery-lane. Hulting or securing wheat. (A communication.) Dated June 13, 1868.

This invention relates to a grain hulling or scouring machine, in which a rough surface cone revolves inside of a revolving cone-shaped screening cylinder, but in a direction contrary to that of the latter, into and between which cylinder and cone the grain to be hulled or scoured is fed by a forced feed, and from the chamber containing the said cone and cylinder. The cleanings, scourings, hulls, dust, and other refuse, are drawn by a forced current of air created by a suction fan whilst the cleaned or hulled grain is carried out of the machine at a separate and remote point from where the cleanings or scourings are taken off. The invention is not fully described apart from the drawings.—Patent completed.

1944 E. FISHER, Camberwell. Tonic efferencing drink.

the drawings.—Patent completed.

1944 E. Fisher, Camberwell. Tonic efferesting drink.
Dated June 18, 1868.

Here the inventor proposes to employ the tonic bitter extract of orange, or other similar tonic extract, from flavoured fruits, and to mix therewith a syrup in such proportion to sult the taste; these materials, being compounded, are to be placed in champagne bottles, or other strong bottles, after which filtered water is forced in by means of the champagne cone, and the bottle is tightly corked and secured.—Patent abandoned.

corked and secured.—Patent abandoned.

1945 C.E. SCHWARTZ, Hoxton. Obtaining crystal brocatel colours. Dated June 13, 1868.

Here the inventor prepares new crystal brocatel colours from mica (Brotel Muscowity, also called "cat selver." For this purpose he takes the raw material, which, when mixed with earthy or iron particles, he breaks into pieces, and purifies by digestion or boiling in hydrochloric acid. It is next freed, by washing, from any acid that may adhere to it, and then dried. The mica thus purified he exposes to a red-hot heat until it has acquired a beautiful silvery glitter. It is then ground down, when in a wet state, between mill stones, or crushed under rollers, or put into a stamping mill in a dry state, and bruised into variously sized lamina, which are sorted by being passed through a sieve or sifting machine, and numbered according to the different sizes. The silver colour thus obtained may be variously tinted by a combination with different colours.—Patent abandoned.

1946 J. Ball, jun., Nottingham. Apparatus employed in

1946 J. Balt, jun., Nottingham. Apparatus employed in the cutting off the superfluous portions of threads from spots, sprigs, figures, or other devices made on lace or other fabrics. Dated June 13, 1868.

special prices of the derical portions of threats from spots, sprigs, figures, or other derical made on lace or other fabrics. Dated June 13, 1868.

Here standards carry bearings for a driving shaft, on which are a fast and loose pulley, and whence motion is transmitted to a shaft carrying knift blades placed at an angle to its length, and radiating from it. Each blade is plain on one side, and scrated on the other. The driving shaft, also, through a second driving shaft, works a roller over which the lace or fabric to be operated upon is passed, having previously passed over another roller. Both rollers are covered with wire carding, and they receive the lace or fabric from between two other rollers, one of which is carried by bearings capable of being turned outwards to readily receive the lace or fabric; above the first wire card roller is a brush driven from the second driving shaft to raise or brush up the superfluous threads from the surface of the lace or fabric provious to its reaching the knife roller, under which it passes; it also passes under a sharp stationary knife. This knife and knife roller are adjustable vertically and horizontally, and with the brush roller can be raised clear of the central standards by a hand lever or equivalent to enable the lace or fabric to be passed back over the lower rollers. The lace or fabric as it passes under the sharp knife will pass over a bar or bridge which supports it while being cut, and it is drawn through the outting machine by passing it between rollers, whereof the lower is driven by the second driving shaft. The lace or fabric when being operated upon may be passed diagonally through the machine from selvage to selvage; the knives and brush roller being raised, the lace or fabric is drawn back for a fresh portion to be operated on.—Patent abandoned.

the chemical formula of which is C 6 H 8 O 6 H O, that is to say, it contains six equivalents of sypil, eight equivalents of hydrogen, six equivalents of oxygen, and one equivalent of water. It is produced by simultaneously casting on incandescent coke contained in a retort heated to a red heat—first, a mixture of water and glycerine; and, second, a jet of olein oil, or carburetted hydrogen, the proportions of which would vary according to the degree of richness or of lighting power desired.—Patent abandoned. doned.

doned.

1949 F. Worgester, Stoke. Tuyers for furnaces. (A communication). Dated June 15, 1868.

The patentee claims, first, the combination with a tuyere or tuyeres of an air chamber or box constructed and arranged substantially as and for the purpose described and illustrated in the drawings. Second, passing the air blast before reaching the tuyere or tuyeres through a water reservoir employed for producing a circulation of water through the said tuyere or tuyeres, substantially as and for the purpose described and illustrated in the drawings. Third, the combination of a hollow tuyere (or tuyeres) with a reservoir, and water and steam pipes, and with the air chamber and parts connected therewith, substantially as and for the purpose described.

—Patent completed.

1950 J. S. Benson and J. Von der Poppenburg, Bir-

—Patent completed.

1950 J. S. BENSON and J. VON DER POPPENBURG, Birmingham. Breech-toading firearms. Dated June 15, 1868.

This invention has reference to those kinds of breech-toading firearms in which the breech end is opened for loading and closed for discharge by means of a block hinged to the side of the breech chamber or shoe, and the invention consists of the improvements described in extracting the exploded cases of the cartridges from the barrels of the firearms, and in holding the breech-block of the firearms in its open or closed positions respectively.—Patent abandoned.

1951 T. KENDRICK, Birmingham. Ornamentation of fenders, &c. Dated June 15, 1863,
This invention consists in the combination of ornamental lacquered brass tubing with ordinary cast iron in the manufacture of fenders, the brass tubing being applied to the parts technically known in the trade as the "bar," the "bead," and the "moulding."—Patent abandoned.

1952 J. H. Johnson, Lincoln's Inn-fields. Zincing baths. (A communication). Dated June 15, 1868.
This invention relates to the zincing of articles of iron or other metal by immersing them in molten zinc, and consists of a zincing bath composed of an outer casing of iron lined with copper or equivalent material for preventing the formation of a dross from the iron and zinc which tends to destroy the iron vessel and renders a great portion of the zinc unfit for coating purposes.—Patent abandoned.

1953 C. HUMPREY, Southwark, and W. S. WEBSTER, runswick-square, London. Waterproofing paper, &c.

1953 C. HUMPREY, Southwark, and W. S. WEBSTER, Brunswick-square, London. Waterproofing paper, &c. Dated June 16, 1868.

By this invention the patentees make the paper waterproof by first saturating the paper itself with any suitable waterproofing solution, and then removing the superfluous solution from the surfaces of the paper by passing it between a pair of wiping surfaces constructed and arranged substantially as described.—Patent completed.

substantially as described.—Patent completed.

1954 W. C. SILLAR, Cornhill; R. G. SILLAR, Upper Norwood; and G. WISNER, Camberwell. Deodoriting and purifying sexage, &c. Dated June 15, 1868.

Here the patentees add to the sewage to be purified a mixture consisting of the following ingredients, viz., alum, blood, clay, magnesia, or one of its compounds, by preference the carbonate or the sulphate manganate of potash or other compound of manganese, burnt clay, otherwise known as ballast, chloride of sodium, animal charcoal, vegetable chareoal, and magnesian limestone. Of these substances the manganese compound, the turnt clay, chloride of sodium, and magnesian limestone, may be omitted, and it is not essential that both animal and vegetable charcoal should be used. If any of the ingredients named should, from any cause, be present in sufficient quantity in the sewage, it may, of course, be omitted from the mixture. The proportion in which the ingredients are to be used vary according to the nature of the sewage to be purified.—Patent completed.

1955 L. B. Pringle, Litchfield, Connecticut, U.S.A.

1955 L. B. PRINGLE, Litchfield, Connecticut, U.S.A. onstructing chairs and rails which form continuous rails for ultroads. Dated June 15, 1868.

Constructing chairs and raus which your railroads. Dated June 15, 1868.

The patentee claims so constructing rails of iron or steel with longitudinal grooves and bevol faces to be put together, and their accompanying chairs, so that, when the two sections or double rails are placed together and secured in their seats, ultimately breaking joints or lapping by each other midway, they form a continuous rail or jointless track for railroads for any desired distance, substantially in the manner and for the purposes specified.—Patent completed.

1956 W. and O. BROOKE, Manchester. Healds or heddles.

Patent completed.

1956 W. and O. BROOKE, Manchoster. Healds or heddles.
Dated June 16, 1868.

This invention relates to a mode of constructing healds, in such manner that each eye for the warp thread will be formed of metal, so arranged that the flat sides of the metal eyes will romain parallel, or nearly so, with the line of the warp threads, and so connected or attached to the material by which they are suspended and actuated, that the ends or edges of the metallic eyes will be prevented from catching upon the adjoining warp threads when working.—Patent completed.

the cutting machine by passing it between rollers, whereof
the lower is driven by the second driving shaft. The lace
or fabric when being operated upon may be passed diagonally through the machine from selvage to selvage; the
knives and brush roller being raised, the lace or fabric is
drawn back for a fresh portion to be operated on.—Patent
abandoned.

This invention consists in a collar constructed with a
waterproof and desiccative or medicated covering, where,
when in use, it is to bear against the surface of a horse or
other animal to which it may be applied. This lining the
patentee usually makes of strong cloth, such as canvas or
kersey, for instance, and a coating of vulcanized caout
chouc or gutta-percha containing sulphur, or other proper
medicament, the coating being applied to the cloth so as
to adhere firmly thereto.—Patent completed.

1948 L. S. THOMMASSIN, Paris. Apparatus for producing
combustible and tiluminating gas. Dated June 15, 1868.
The subject of the present invention is a combustible
and lighting gas, or carburetted hydrate of oxide of sypli,

1958 R. WAPPENSTEIN and R. BAY, Manchester. Apparatus for registering the number of passengers travelling in or on omnibuses, &c. Dated June 16, 1868.

For omnibuses the inventors employ for each journey or stage of the journey a double meter for the inside, and another double meter for the outside, one division of each meter being used for indicating the entrance, and the other the departure of the passengers, and in one or more conspicuous positions they place deals and fingers to be used as check or tell-tales.—Patent abandoned.

used as check or tell-tales.—Patent abandoned.

1959 D. ELDER, Newcastle-upon-Tyne. Dredging machines. Dated June 16, 1868.

The object of this invention is to facilitate the sinking of cylinders or caissons for the foundation of bridges and other works, where ground has to be removed from below the level of water, or for shafts or other similar excavations where earth has to be raised vertically; also for excavations where earth has to be raised for docks, canals, or similar objects. The nature and description of the invention consists in the application of an endless chain of buckets, driven and carried by apparatus fixed on a turntable, which is made to rotate upon a foundation plate temporarily fixed on the top of the cylinder or caisson to be sunk, or over the shaft to be excavated. In operation the apparatus has to be removed when a length of cylinder has to be added, and extended to the required length when replaced.—Patent completed.

1960 T. WHITEHAD, Holbeck, Leeds. Machinery for

1960 T. WHITEHEAD, Holbeck, Leeds. Machinery for combing wool, &c. Dated June 16, 1868. This Invention consists in the application of nipper rollers or other holders to any description of combing machines known or used in the combing trade.—Patent abandoned.

machines known or used in the combing trade.—Fatent abandoned.

1961 J., J., and J. Beoth, Rodley, Leeds. Apparatus for the cutting or dressing of stone, &c. Dated June 16, 1863.

This invention relates, first, to when using lever holders for the cutters used in the cutting or dressing of stone, to giving motion to such cutters by mechanical means, so that the opposite sides or cutting edges of them may be used alternately. Second, the improvements relate to means of giving support to thin slabs of stone during the action thereon of the cutters. Third, the improvements relate when series of tables carrying stone to be cut by suitable cutters are caused to travel round a centre of motion, to causing such tables to be actuated so that the stone thereon may move to the action of the cutters acting thereon in straight or other lines, diverging from a direct circular motion, so as to afford facilities for varying the character of the cut produced. Fourth, the improvements relate to giving vibratory or alternating transverse motion to tables carrying stone during the cutting thereof by suitable cutters. The invention is not described in detail apart from the drawings.—Patent completed.

1962 M. Dramar, Paris. Dial or indicating needle case

1962 M. DEMMAR, Paris. Dial or indicating needle case Dated June 17, 1868.
This Invention is not described apart from the drawings.
—Patent completed.

1963 J. P. WILLS and E. H. CARDELL, South Petherwin, fornwall, and T. F. WILLS, Princes-square, Bayswater, pparatus for mowing or reaping grass, &c. Dated June 17,

1868. Instead of the reciprocating knives now employed in such machines, the inventors use revolving cutters, serrated at the edge, or otherwise adapted to the cutting of straw or grass, and of any convenient shape.—Patent abandoned.

1964 D. MITCHELL, Macclessield, Cheshire. Manufacture of figured cloth. Dated June 17, 1863.

The nature of this cloth is that it is a single and solid cloth with neither weft nor warp, and the figure is raised without wadding or stuffing. And the manner in which it is to be parformed or wovon is in the manner described in detail in the specification.—Patent completed.

in detail in the specification.—Patent completed.

1965 G. B. TURRELL, New York, U.S.A. Coolers for beer, &c. Dated June 17, 1868.

The patentee claims, first, a cooler for beer and other liquids, formed of a series of flattened tubes, with their longest diameters horizontal, substantially as specified, so that the strata of liquid passes in the manner described; and, second, he claims the employment in coolers for beer and other liquids, acting in the manner described, of tubes, rods, or bars, to eccupy the centre of the tubes, the water being caused to pass through the space left between the outer tubes and the tubes, rods, or bars occupying the centre thereof, substantially as shown and described.—Patent completed.

Patent completed.

1966 W. Betts, Hastings, Sussex. Apparatus for weighing carriages, waggons, carls, &c. Dated June 17, 1863.

This invention consists of two springs of elliptic, semi-elliptic, or other convenient form, fixed either separately on two trostles, or on a stand sufficiently long to receive a carriage or vehicle. A graduated bar as an indicator passes through the trostles or stand, such indicator being marked with notches and figures to register the weight of the carriage by the deflection of the two springs, adding the sum of the two indicators together, or connecting the two indicators, and thus reading off the weight at once. The inventor also uses a dial, as registering the weight placed upon the springs. On the top of each spring is fixed a block or cushion, on which the axiotree of the vehicle rests, so that the carriage may be entirely suspended, and the weight correctly ascertained as registered by the indicator.—Patent abandoned.

1967 T. COMFIELD, jun., Ohigwell, Essex. Brakes for

by the indicator.—Fatent sonationed.

1967 T. COMFIELD, jun., Chigwell, Essex. Brakes for railway carriages. Dated June 17, 1868.

An extension of time for filing the final specification of this invention having been grunted, the documents relating to the invention cannot at present be seen.

lating to the invention cannot at present be seen.

1968 J. M'LEOD, Renton, Dumbartonshire. Apparatus for dyeing yarns. Dated June 17, 1868.

This invention has for its object, by means of improved apparatus, to secure the dyeing of yarns in a more uniform and satisfactory manner, and with less manual labour than heretofore. The principal features of novelty in the improved at paratus are the arranging of a number of poles for carrying and working the yarn hanks upon sliding bars made to reciprocate horizontally, and the applying of gearing to turn the poles so as to gradually move round and change the positions of all parts of the hanks.—Patent completed.

1969 W. CARR, Manchester. Construction of hinges ap-licable to the doors of carriages, coaches, &c. Duted June 17, plicable to the

This invention relates to hinges employed for the doors f carriages, coaches, landau, barouches, and other



rehicles, and is designed for the purpose of enabling the door be opened to the full width of the doorway, and to hang vertically when open, and when closed the hinge to arranged within a box that water cannot enter into the woodwork of the carriago frame.—Patent abandoned.

so arranged within a box that water cannot enter into the woodwork of the carriago frame.—Patent abandoned.

1970 J. C. WALKER, Surrey-street, Strand. Baking 1970 J. C. WALKER, Surrey-street, Strand. Baking 1970 determined to be employed in the treatment of four in the manufacture of bread. Ac. Dated June 17, 1868.

The object of this invention is to produce a baking The object of this invention is to produce a baking the training the produce of the produce of the manufacture of light bread. Amylaceous matter the manufacture of light bread. Amylaceous matter which is insoluble in water may be dissolved in concernic trade hydrochloric, phosphoric, sulphuric, or nitric acid trade hydrochloric, phosphoric, sulphuric, or nitric acid trade hydrochloric, phosphoric, sulphuric, or nitric acid rated hydrochloric, phosphoric, sulphuric, or nitric acid rated hydrochloric, phosphoric, sulphuric, or nitric acid rated if solved by one of these acids greatly diluted, at readily dissolved by one of these acids greatly diluted, at readily dissolved by one of these acids greatly diluted, at readily dissolved to of the amylaceous matter is acid its of remains unchanged, the amylaceous matter is acid its of remains unchanged, the amylaceous matter is acid in account of the photocose as pecies of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, a species of resombles gum arabic, and next into glucose, as pecies of resombles gum arabic, and next into glucose, a speci

farinaceous food.—Patent abandoned.

1971 W. and J. RHODES, Braiford. Construction of safes, strong frooms, &c. Dated June 17, 1863.

This invention consists, principally, in the use of strong This invention consists, principally, in the use of strong are of iron, made of such a form, and placed in such a brais of iron, made of such a form, and placed in such a manner, in connection with a secret hinge to the door, as manner, in connection with a secret hinge to the door, as sible, to break open. A furturer improvement consists in the use of a Lewis and wedge, or dog and wedge arrangement, to act as a locking bolt for binding or connecting ment, to act as a locking bolt for binding or connecting to a sunder either by a wedge or screw; also cannot be force of as sunder either by a wedge or screw; also in so coupling the front bars of the safe to the outside plates thereof that they cannot be forced off by a wedge or other instrument.—Patent completed.

1972 A. M. CLARK, Chancery-lane. Purification of

or other instrument.—Patent completed.

1972 A. M. CLARK, Chancery-lane. Purification of ceramic, ritrifable, and other matters. (A communication). Dated June 17, 1868.

Purifying matters used in the manufacture of glass, Purifying matters used in the manufacture of glass, crystal, porcelain, or china, and also enamels, kaolin, phosphates of line, feldspath, and generally all primary inters containing iron in the form of oxide or other satts matters containing iron in the form of oxide or other satts freolouring the same or liable to tinge the matters after their transformation which iron it is desired to eliminately the said of hydrochlorate of ammonia, or a suitable by the said of hydrochlorate of ammonia, with which ties ammoniacal saft, or it may be ammonia with which ties incommoniaced in a volatile form, all in the manner described.—Patent completed.

1973 W. THOMSON, Normanton, York, and J Choserve.

described.—Patent completed.

1973 W. THOMSON, Normanton, York, and J. CROSSLEY, jun., Barrow-upon-Soar, Laucashire. Rails and chairs for jun., Barrow-upon to consists in constructing reversible rails. This invention consists in constructing reversible rails for railways, and the chairs for such rails, in such manner for railways, and the chairs for such rails, which is downwards, that the wearing face of the rail, which is downwards, will not become worn or indented by the chairs. For this will not become worn or indented by the chairs. For this will not become worn or indented by the chair of such form that the rail rests on the bottom of the chair at one side, and on the top of the chair at the other side, one edge of the top, and one edge of the bottom of the rail being suitably shaped for this purpose.—Patent abandoned.

being suitably shaped for this purpose.—Patent abandoned.

1974 J. and E. LUMLEY, Kirk Hamerton, Yorkshire:

Machine for the manufacture of pills. Dated June 18, 1863.

Here a suitable framing supports three rotating cylinders. Here a suitable framing supports three rotating cylinders having grooves formed around their peripheries. Two of having grooves formed around their peripheries. Two of ingredients into the machine and partly divide it lengthed in the said cylinders being of equal diameters; the mass wise, the said cylinders being of equal diameters; the massive the diameter of which is about double that of the cylinder, the diameter of which is about double that of the cylinder. An adjustable curved guide-aforeasid smaller cylinder. An adjustable curved guide-formed in the same guide-piece, corresponding with the formed in the same guide-piece, corresponding with the formed in the cylinders. The knife, after having entirely divided the mass crosswise, conducts it between the guide and the cylinder, and ensures its being taken hold of thereby, and the cylinder, and ensures its being taken hold of thereby, and rolled into pills which fall into a receptacle. Combs are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders for preventing are adapted to the grooves of the cylinders. Combs are defined for imparting rotary motion to the machine.

Patent completed.

1975 A. Ringway, Upton, near Macclessfeld, Cheshire.

1987 B. Ringway, Upton, near Macclessfeld, Cheshire.

may have a hywater axed mercon, into which a handle may be fixed for imparting rotary motion to the machine.—

1975 A. Ringway, Upton, near Macclessleld, Cheshire.

1975 A. Ringway, Upton, near Macclessleld, Cheshire.

1976 May rakes. Dated June 18, 1868.

1976 These improvements consist in mounting each prong or these improvements consist in mounting each prong or these improvements consist in mounting each prong or the loosely on a central shaft, enclosed within a box, or better and upper and lower plate, and arranged so as to tween an upper and lower plate, and arranged so as to tween an upper and lower plate, and arranged so as to tween an upper and lower plate, and arranged so as to tween an upper and lower plate, and arranged so as to the wrake" is being thus dragged, the loosely mounted the "rake" is being thus dragged, the loosely mounted the "rake" is being thus dragged, the loosely mounted the "rake" is being thus dragged, the loosely mounted the requalities on the ground, and gather or collect ting and the set of teeth which are foremost when collecting, and the set of teeth which are foremost when collecting when loaded with a sufficient quantity of hay, is tilted so when loaded with a sufficient quantity of hay, is tilted so as to cause them to meet the ground, which effects the asto cause them to meet the ground, which effects the turning over of the rake, thereby bringing the other teeth turning over of the rake, thereby bringing the other teeth turning over of the rake, thereby bringing the other teeth turning over of the rake, thereby bringing the other teeth turning over of the rake, thereby bringing the other teeth turning over of the rake, thereby bringing the other teeth turning over of the rake, thereby bringing the other teeth turning over of the hay, is titled so with the percentage of the hay, is titled so the rake, thereby bringing the other teeth turning over of the hay, is titled so the rake of the hay, is titled so the translation.

1976 A. Coerran, Kirktonfield, Renfrewshire, North

pleted.

1917 C. Attwood, Wolsingham, Durham. Moulds for Castiny. Dated June 18, 1868.

This invention relates to moulds for the reception of Moulden or cast steel, and consists in the admixture with sand, loam, or other numerial now generally employed the sand, loam, or other numerial now generally employed by moulders, of solid carbonaceous substances, or of hydrosprons, or other fusible or liquid carbonaceous matters, or oily substances or other substances which are sufficiently and the sufficient of the substances which are sufficiently and supplies the supplies of the substances which are sufficiently and supplies the supplies of the substances which are sufficiently and supplies the supplies

ciently rich in carbon, so that the moulds, when formed of a mixture of sand, loam, or other moulding material with the before-mentioned substances, or some of them, will surround the casting or ingot with a protective deoxidizing surround the casting or the deteriorating action of the atmospheric air upon the heated metal.—Patent abandoned.

doned.

1978 G. F. Redfern, South-street, Finsbury. Machinery for drawing rorings and spinning yarns of cotton, &c. (A communication). Dated June 18, 1863.

This invention consists, first, in novel mechanism for this invention consists, first, in novel mechanism for stretching, condensing, drawing, and twisting the rovings stretching condensing, drawing, and twisting the roving of wood, cotton, and other fibres in a stationary frame, either in direct connection with spindles operating on the cither in direct connection with spindles operating on the twind the yarn on in the or connected with spools to wind the yarn on in the combining these drawing and twisting devices with spindles operating on the throstle spinning principle, spindles operating on the throstle spinning principle, with a continuous thread twisted by means of flyers, with a continuous thread twisted by means of flyers, with a continuous thread twisted by Teatent abandoned 1979 T. C. Hyde, Fenchurch-street. Dressing flax. (A

rings, or cups. There is much detail.—Patent abandoned 1979 T. C. Hydr. Fenchurch-street. Dressing flax. (A communication). Dated June 18, 1868.

In dressing flax according to this invention the flax is In dressed in the direction of its growth and fibre, that is to dressed in the direction of its growth and fibre, that is to direction of the root, and the remaining length is direction of the root, and the remaining length is dressed the reverse way, that being in the direction of its growth and fibre. When each piece of flax has thus been growth and fibre. When each piece of flax has thus been growth and fibre. The root ends are then by themselves drawn, root end. The root ends are then by themselves drawn, rove, and spun in the direction of their growth and fibre, whilst the remaining portions or tops are also by themselves drawn, rove, and spun in the direction of their growth and fibre. The above is only one part of the invention; there are various other features.—Patent completed.

ition; there are various other features.—Patent completed.

1930 C. HENGST and H. WATSON, Fulham, London.

Manufacturing gas. Dated June 18, 1858.

This invention consists of certain conformations and
This invention consists of certain conformations and
this invention consists of certain conformations and
conformation of carburetted hydrogen gas from hydrocarduction of carburetted hydrogen gas from hydrocarduction of carburetted hydrogen gas from hydrocarduction of carburetted hydrogen and heating purposes,
someous spirit for illumination and heating purposes,
and also in imparting to the gas produced an additional
control of hydrogen and oxygen during the process of
equivalent of hydrogen and oxygen being obtained
by the admixture of atmospheric air with the vapour and
by the admixture of atmospheric air with the vapour and
susceous matter evolved from the hydrocarbonaceous
giseous matter evolved from the hydrocarbonaceous
gisteous matter evolved and combined all vaporous matter,
the gas when evolved and combined all vaporous matter,
by filtration and other means through mediums, thereby
leaving nothing but pure, dry, uncondensible matter to be
consumed by the ordinary methods of combustion for
illumination and heating.—Patent completed.

1981 W. S. Carr, New York, U.S.A. Water-closets

numuation and neating.—ratent completed.

1981 W. S. CARR, New York, U.S.A. Water-closels
bated June 18, 1868.

This invention is not described apart from the drawings.

-Patent completed.

This invention is not described apart from the drawings.

Patent completed.

1982 J. Hemisoton, Chatteris, Cambridge. Apparatus for grinding or sharpening the cutters of reaping and moving machines. Dated June 18, 1868.

The patentee claims, first, the general combination and arrangement of machinery or apparatus for grinding and sharpening the cutters of reaping and mowing machines, second, the application and use to, and in the grinding or sharpening of the cutters of reaping and moving machines, of a parallel edge grinding disc of stone, mowing machines, of a parallel edge grinding disc of stone, mowing machines, of a parallel edge grinding disc of the arime capable of adjustment to but the level of the atomic capable of adjustment to but the level of the active, substantially as described. Third, the use of the adjustable frame which carries and adjusts the disc or adjustable frame which carries and adjusts the fourth, stone to the angle or level required, as described. Fourth, stone to the angle or level required, as described. Fourth the use of a swivel claim for holding the cutter bar whilst the use of a swivel claim for holding the cutter bar whilst the use of a swivel claim for holding the cutter bar whilst the use of a swivel claim for holding the cutter bar whilst the use of a swivel claim. King William-street, West 1983 E. R. KAULBACH. King William-street, West Straul. Rolary engine. Dated June 19, 1865.

This invention is not described apart from the drawings.

1984 A. MACKIE, Warrington. Setting and distributing ture.

Patent completed.

1984 A. Mackie, Warrington. Selling and distributing type.
Dated June 19, 1889.
This invention relates to "composing" machinery of receptacles, and to arrange the same in any desired order receptacles, and to arrange the same in any desired order receptacles, and to arrange the same in any desired order receptacles, and consists, more particularly, in one receptacle, and consists, more particularly, in the ordinary acceptation of the term, and also capable in the ordinary acceptation of the term, and also capable in the ordinary acceptation of the term, and also capable of "setting up" or "composing" two or more lines or type simultaneously. The details of the invention are voluminous.—Patent completed.

1985 J. Perry, Rathdowney Brewery, Oncome Countries.

nous.—Patent completed.

1985 J. Perry, Ratidowney Brewory, Queen's County, This invention consists in packing bothers and similar articles in any suitable case or holized patents of the transport, or simply for storage, by smaller articles, faid over and unor reference are an anorem the keeneral bottles, only a saling alternately for transport, or simply for storage, by smaller articles, faid over and unor reference are a transported and reference and unor of more thicknesses.—Patent completed.

1986 D. and J. Grrkie, Edinburgh. Lithographic printing machines, the surface of the printing machines, the surface of the printing machines, the surface of the printing and the series of the printing reference on the printing and the series of the expliner, and the liner edge of the plate is surface of the cylinder, and the liner edge of the plate is statehed to a links which sild on these rods or links which sild through the earlier of the cylinder, and the liner edge of the cylinder and the liner edge of the cylinder, and the liner edge of the cylinder and the check formed on the shaft a lever is liked outside of the cylinder, and the shaft a lever is liked outside of the cylinder, and the liner edge of the cylinder and

sequence of the parallel motion of the gripper, no displacement of the sheets of paper is caused after being laid to the gauze, which is a great advantage, especially in registering for coloured work (in many printings). This gripper will operate either with or without points in registering.—Patent completed.

1987 W. E. NEWTON, Chancery-lane. Apparatus fo agrid navigation. (Δ communication). Dated June 19,

1868.

The object of this invention is to construct such an apparatus as will enable acronauts to navigate the air, and steer the machine in any desired direction. This object is effected by a combination of improvements consisting, effected by a combination of or modifying the form or under one head, in changing or modifying the form or shape of the acrostat, so as to obtain a less resisting such as for the wind to act upon, and obstruct its passage through the sir.—Patent abandoned.

through the air.—Patent abaudoned.

1983 M. P. W. BOLTON, Tew Park, Oxfordshire. Apparatus for obtaining matter power by the combustion of infimmable aeriform fluids. Dated June 19, 1865.
This invention has reference to two previous patents, dated respectively March 10, 1866 (No. 738), and July 8, 1867 (No. 2081). We cannot here give space to the voluminous details of the present invention.—Patent completed.

pleted.

1989 F. B. DŒRING, Victoria-street, and R. H. TWIGG, East India Avenue, London. Machinery for boring or twoking in rock. &c. Dated June 19, 1868.

The object or this invention is, first, to discusse with the object or this invention is, first, to distribution of valve for regulating the admission and distribution of compressed air or other motive fluid to the cylinders of engines for boring or working in rock, stone, or earth, The second part of the invention relates to apparatus and appliances to be used in connection with boring engines when they are required to descend into a hele. The invention is not described apart from the drawings.—Patent completed.

1990 A. J. P. B. Therry, Paris. Marine relocioeds.

1990 A. J. P. B. THERRY, Paris. Marine relocipedes
Dated June 19, 1893.
This new automatic apparatus is worked either by the
feet or hands, or by both feet and hands together, or, it may
be, by any mechanical means derived from the motivo
power of air and steam together or separately, and it is
composed of one, two, or several floats made of any metal,
composed of one, two, or several floats made of any metal,
or of wood, or of india-rubber, or of gutta-percha, or of any
other impermeable material. The floats are connected and
sixed together, whatever may be their number, by bands
of metal or wood, or by other means, so as to maintain
of metal or wood, or by other means, so as to maintain
them at the distance apart necessary to their perfect
solidity and stability, and at the front, middle, or, in short,
in the most suitable place between the floats, a paddlein the most suitable place between the floats, a paddlemarine velocipede may be placed. This invention comprises a vast amount of detail which we cannot here give
space to.—Patent completed.

1991 T. HEPPELL, Pelaw Main Collieries, Durham.

space to.—Patent completed.

1991 T. Heppell, Pelaw Main Collicries, Durham.

Miners' safety lamps. Dated June 19, 1868.
The patentee uses an arrangement of miners' safety lamp embodying the following improvements in which the light from the flame of the lamp is transmitted through class, thus furnishing a less obscure light than is obtained from lamps where the light is transmitted through wire gauz 9—Patent completed.

# APPLICATIONS FOR LETTERS PATENT.

Dated December 21, 1863.
3993 W. E. Gedge, Wellington street, Strand. A novel tuminous composition, termed "resinous bitumen." (A parameter time) 3893 W. E. Gedge.
bituminous composition, termed "resinous braziles
communication).
3894 P. G. Jarre, Boulevard Nouvelle, Paris. A hydro-

3894 P. G. Jarre, Boulevard Nouvelle, Paris. A hydro-pneumatic pump.
3895 W. E. Gedge, Wellington-street, Strand. An im-3895 W. E. Gedge, Wellington-street, A communication).
3896 J. Breeden, Birmingham. Improvements in taps or valves for liquids, gases, and vapours.
or valves for liquids, gases, and vapours.
3897 J. Clayton, Preston, Lancashire. Improvements in apparatus for working the valves of steam and other en-gines.

apparatus for working the various agines.

399 G. Ritchie, Folkestone, Kent. Improvements in constructing parasols, and weather protectors, or tents, constructing parasols, and weather protectors, or tents, experiments in apparatus for communicating between the provements in apparatus for communicating between the passengers and guard and engine driver of railway trains, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, Great St. Helen's, City, 1990 H. T. Vanner and E. Prest, 1990 H. T. Vanner and 1990 H. T



Sezille, Paris, Rue de Lancry, Improvements 3912 A

3912 A. Sezille, Paris, Rue de Lancry. Improvements in treating corn for panification.
3913 W. Clay, Liverpool. Improvements in the manufacture of forgings.
3914 J. G. Jennings, Palace Wharf, Lambeth, Surrey. Improvements in apparatus for treating sewage, and for irrigating land with sewage and other waters.
3915 B. Norton, Nortonthorpe Mills, near Huddersfield, Yorkshire. Improvements in tipping pile fabrics.
3916 W. E. Gedge, Wellington-street, Strand. Improvements in the construction of floating docks intended for raising and careening vessels, and also for their construction. (A communication).

Dated December 23, 1868.
3917 B. W. Maughan, Goswell-road, Middlesex. Improvements in apparatus for the heating of water and other liquids applicable for baths and other purposes.
3918 E. M. Thornton, Brooke-street, Holborn. Improvements in footstools, foot cushions, or hassocks, which improvements may also be applied to chairs, couches, or other similar articles of furniture.
3919 G. M. Wolmershausen, Mayfair, Middlesex. An adjustable apparatus for obtaining the form of the human figure.
3920 W. G. Reeve, Greenwich, Kent, Improvements

figure. 3920 W. G. Reeve, Greenwich, Kent. Improvements

agure.

3920 W. G. Reeve, Greenwich, Kent. Improvements in inkstands.

3921 G. Hookham, Oxford. Improvements in sash lines and pulleys for the same, also in fastening such lines to sashes, and in sashes and frames used therewith, such improvements in sash lines being applicable to cords, lines, straps, and bands for cranes and other purposes.

3922 G. Lowry, Salford, Lancashire. Improvements in bushes or ferrules for casks and other purposes, and for improvements in fixing the same.

3923 H. G. Thompson, Southampton-buildings, Chancery-lane. A new and improved manufacture of figured terry or cut pile carpets and other figured fabrics.

3924 J. H. Johnson, Lincoln's Inn-fields. Improvements in the construction of plates for holding artificial teeth. (A communication).

3925 W. E. Gedge, Wellington-street, Strand. Improved electric bell-sounding and telegraphing apparatus for domestic use. (A communication).

3926 F. P. Warren, Northumberland House, High-road, Lee, Kent. Improvements in cooking apparatus, which improvements are applicable also to other apparatus for transmitting heat to liquids and generating steam.

3927 J. W. Wilson, Craven-street, Strand. Improvements in the construction of hydraulic lifts.

3928 A. V. Newton, Chancery-lane. Improvements in treating cod-liver oil or fatty matters to render them acceptable to the palate. (A communication).

3929 A. M. Clark, Chancery-lane. Improvements in gas burners. (A communication.)

Dated December 24, 1868.

3930 W. H. Walenn, Talbot-road, Tufnell Park West, Holloway, Middlesex. Improvements in the electric deposition of copper and brass.

3931 T. Warren, Glasgow. Improvements in the preservice and transmission of electric telegraphic

furnaces.

3923 J. H. Johnson, Lincoln's Inn-fields. Improvements in the preparation and transmission of electric telegraphic despatches, and in the machinery, apparatus, or means employed therein. (A communication).

3933 W. R. Lake, Southampton-buildings, Chancerylane. An improved carriage boat designed for use on either land or water. (A communication).

3934 C. D. Abel, Southampton-buildings, Chancerylane. Improvements in rolling mills. (A communication).

3935 H. Robinson, Bridge Mills, Lewisham, Kent, and J. Smith, Carshalton, Surrey. Improvements in apparatus for dressing millstones.

3936 R. Boby, Bury St. Edmunds, Suffolk. Improve-ments in the construction of floors for malt kilns or

systements in the construction of floors for malt kilns or drying rooms.

3937 H. C. M. Turnbuil, Naval and Military Club, Piccadilly. Improvements in apparatus or means for working punkahs or fans.

3938 H. Clifford, Greenwich, Kent. Improvements in the manufacture of submarine telegraph cables.

3939 W. H. Ridgway and F. W. Walker, Hanley, Staffordshire. Improvements in the manufacture of ornamental bricks, tiles, slabs, and other like articles, and in the machinery or apparatus employed therein.

3940 A. C. Pilliner and J. C. Hill, Oakfield Works, near Newport, Monmouthshire. Improvements in machinery for obtaining motive power, applicable also to measuring, raising, exhausting, forcing, and compressing fluids.

3941 G. T. Bousfield, Loughborough Park, Brixton, Surrey. Improvements in steam valves and their adjuncts. (A communication).

3942 W. Ehrhardt, Birmingham. Improvements in watches.

watches.
3943 H. Hillebrandt, Birmingham. Improvements in

repeating firearms. (A communication).

Dated December 26, 1868.

3944 C. E. Brooman, Fleet-street, City, patent agent.

An improved portable lamp or lantern. (A communication).

3945 E. Butterworth, Calder Cottage, near Rochdale, ancashire. Certain improvements in, or applicable to,

Lancashire. Certain improvements in, or applicable to, furnaces.

3946 C. Gordon, Goswell-road, Middlesex. Improvements in the construction of breech-loading firearms.

3947 G. Eldridge, Essex-place, Grange-road, Dalston, Middlesex, and I. Smitth, Almorah-road, Downham-road, Islington, Middlesex. Improvements in apparatus for closing casks and filling and drawing off liquid therefrom.

Dated December 28, 1868.

3948 J. P. Mills, St. Helena-place, Wilmington-square, Middlesex. Improvements in the rest pins or keys for pianofortes, harps, and all other musical string instruments.

3949 A. S. Harington, St. James's Club, Piccadilly. An improved pouch for tobacco and other articles used by smokers.

smokers.

3950 W. R. Lake, Southampton-buildings, Chancery-lane. An improved machine for pegging boots and shoes.
(A communication).

3951 H. Yorath, Molton Penmark, Cowbridge, Glamor-

gaushire. Improvements in apparatus for elevating corn, hay, and other crops on to stacks.

### NOTICES OF INTENTION TO PROCEED WITH

PATENTS.
From the "London Gazette," December 29, 1868.
4 H. Y. D. Scott. Pottery kilns.
75 J G. Tongue. Mills for grinding. (A communica-

2576 D. G. Fitz-Gerald. Constructing electric tele-

2576 D. G. Fitz-Gerand.
graphs.
2578 P. Rapsey and W. Hodge. Manufacture of black
or brown pigments.
2594 J. Sawyer. Hanging window sashes.
2598 A. Rollason. Parifying coal gas.
2602 T. Haigh. Apparatus to be used in brewing.
2604 E. J. E. Niepce. Safety blinkers. (A communica-

2604 E. J. E. Niepce, Salety Bilineris. (A communication).

2605 J. H. Johnson. Manufacturing wheat into flour.
(A communication).

2608 T. W. Rammell. Centrifugal machines.

2615 W. J. and C. A. Kesselmeyer. Governors for steam engines. (Partly a communication).

2617 J. Watson. Blast furnaces.

2623 W. Chorlton. Heald warpers.

2625 G. Tidcombe. Means for removing dirt from the bottoms of boots

2626 A. F. Eckhardt. Manuring grain.

2639 B. J. Cohen. Apparatus for receiving memoranda.

2643 J. Gillott and P. Copley. Apparatus for cutting coal.

oal. 2851 W. Hall. Rotary engines. 2686 J. Greenwood. Looms for weaving. 2743 W. E. Newton. Mariners' compasses. (A com-

2743 W. E., Newton, Mariners' compasses, (A communication),
2755 A. V. Newton, Machinery for knitting, (A communication),
2777 A. M. Clark, Metallic spring packings, (A communication),
3093 J. and S. W. Varley, Machinery for treating waste

silk.
3316 W. Brown. Machinery for rolling metals.
3415 J. Hickisson. Manufacture of pencils.
3504 F. O. Ward, W. Ibotson, and A. G. Southby. Apparatus for drying down alkaline solutions.
3511 H. D. Hoskold and G. P. Wheeler. Artificial fuel.
3619 W. E. Newton. Oil cups or lubricators. (A communication)

munication).

3732 J. Fitter, Manufacture of the nuts of table ex-

panders.
3757 W. G. Manwaring. Sewing machines.
3828 A. M. Clark. Processes for inlaying metals. (A communication).

communication).

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.
Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application. of the objection to the application.

#### LIST OF SEALED PATENTS Sealed December 29, 1868.

2093 J. Blomfield •   2158 G. Morton	
2094 M. Bebro, O. Hop- 2170 W. Tasker	
wood, and W. Elam 2175 T. J. Mayal	ı
2099 R. Ward 2183 A. M. Clark	
2100 T. Ward and W. S. 2197 R. Mackie	
Black 2206 A. Munro	nd
2105 C. F. Crailsheim Adamson	
2109 H. H. Henson 2217 J. Cope and	J.
2111 J. D. Pinfold brook	
2113 E. J. Scott 2219 W. Shaw	
2121 A. F. Robertson 2220 W. B. Farwe	116
2124 C. Roussel 2314 P. Pearson	
2129 J. B. Brown 2492 F. Le Roy	
2134 A. Fryer 2542 W. Shaen	
2135 A. Albini 3165 W. R. Lake	
2144 A. Fryer 3365 W. R. Lake	

### PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

5 T. Prideaux
16 A. and W. Young
84 R. A. Brooman
85 R. A. Brooman
115 N. W. Wheeler
321 S. Chatwood
3328 E. Clitton
3336 E., J. C., and J. Lones,
J. and T. Brettell,
and C. Vernon

PAID.

3334 G. and D. Hurn

3338 J. Fisher

3342 J. Rea

3345 J. Young

3369 A. Bar llay

3350 N. W. Wheeler

3351 N. W. Wheeler

3353 J. Bates, and E. and

E. W. Brookes

3358 R. A. Brooman

W.B. Brad-

### PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

56 H. Bessemer 3214 J. H. Johnson 3127 J. Rosindell

3235 R. Needham 3249 E. Lord 3258 J. B. Payne

#### OF SPECIFICATIONS PUBLISHED, For the week ending December 26, 1868

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	P	r.
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1480	0 1	3 1529	2 10	1569	0 8	1609	0 4	1633	0 4	1663	0	4
1482	1	611533	0 8	1570	0 4	1613	1 0	1634	0 4	1664	0	4
1485	0	611535	0 8	1575	0 10	1614	0 4	1635	0 4	1668	0	8
1487	0	8 1540	0 8	1577	0 8	1615	0 10	1636	0 4	1669	0	4
1490	1	4 1548	0 8	1588	0 10	1616	0 4	1640	0 4	1679	0	4
1496	0	8 1549	0 10	1584	0 10	1619	0 8	1641	0 4	1671	0	4
1497	0	8 155:	1 6	1588	0 4	1620	0 4	1647	0 4	1673	0	4
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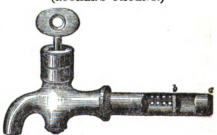
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least disturbed.

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THE

### MECHANICS' MAGAZINE.

LONDON: FRIDAY, JANUARY 8, 1869.

#### ELECTRICITY AND TELEGRAPHY FOR 1868.

IN concluding our remarks upon the above subject, we may first observe that a gth of 500 miles for an alternative section in the Persian Gulf has been manufactured by Mr. Henley, at Woolwich, and will in all probability be sent out during the course of the present month. The insulating medium in this cable was also Hooper's material. The Indian Government, having so favourable an opinion of this material from previous trials, determined on its use. The adoption of this material in two such long lengths will, in the course of a few years, undoubtedly set at rest the question of superiority between it and gutta-percha, and more especially with regard to their adaptability for hot countries. Mr. Henley has also manufactured some length of cable for the Danish Company, to be laid from the Danish coast, across the Baltic, to the island of Bornholm, and from there to Liban, in Russia. and from there to Liban, in Russia. A portion of this eighty miles of two-wire cable from Denmark to Bornholm has just been laid; the remainder, a length of 240 miles, has not yet been laid, the severity of the weather having prevented the ship from accomplishing the work.

The India-rubber, Gutta-percha, and Telegraph Works Company manufactured at their works at Silvertown a cable for the American Company, to be laid between Cuba and Florida, as a duplicate of that already down. The length was about 105 miles, and the work of laying undertaken by Sir Charles Bright; in paying out the cable the Gulf Stream proved too strong, so that when they got close to the Cuban shore, in addition to being carried away to leeward of their landing place, they ran short of cable, and lost the end in buoying.

After numerous attempts, partly successful and partly otherwise, the expedition returned. Sir Charles Bright has gone out again lately with more cable to endeavour to recover the end of the cable and complete the communication. In the interests of telegraphy, we trust he may be successful, and that early in the year we may be able to announce the successful completion of the work. The Silvertown Company also manufactured a length of thirty-three miles of massive cable for changing the landing-place of the Zandvoort cable from Dunwich to Lowestoft. This work was successfully accomplished during the summer. A length of old Hague cable was covered by them for resuscitating the communication with the Isle of Man, which has lately been done. In addition to the above, a cable of 200 miles in length has been manufactured for Tasmania at Mr. Henley's works at North Woolwich for the Telegraph Construction and Maintenance Company. This cable will leave early in January under the charge of experienced hadds

As a proof of the great extension of sub-marine telegraphy, the following details of the amount of cables manufactured at the different works will be satisfactory:—Telegraph Construction and Maintenance Company-Malta and Alexandria cable, 960

pany-Cuba and Florida cable, 104 miles extra cable for same place, 15 miles; Lowes-toft and Zandvoort cable, 33 miles; Isle of Man cable, 12 miles; total, 164 miles. Grand total, 3,289. A grand total of 3,300 miles cannot but be considered as a great result for the year's work. Compare this with the preceding year, and all doubts as to progress will at once vanish.

We are glad not to be able to announce the demise of any member of the important cable family. Accidents will happen, and cables, unfortunately, are not free from themwitness the 1866 Atlantic cable, which was broken in two places about eighty miles from Newfoundland. Owing to there being no ship appointed to the station, although there is some talk of the matter, the repairs were not completed until two months had elapsed.

The Wexford cable has been broken and repaired, as also the Lowestoft and Zandvoort cable, the repairs in both cases being speedily effected. The cables also across the traits of Dover have frequently suffered, but communication by that route, though endangered, has never been totally interrupted. In each case the damaged cable was quickly restored to communication. The cable between Malta and Sicily has been broken and repaired, and the cable between Sicily and the African coast has been restored to communication.

The Persian Gulf cable has been interrupted on three occasions, but thanks to having a repairing ship on the station, the interruptions were not of long duration. Owing to the same wise precaution of having a repairing ship, the breaksdown of the Malta and Alexandria shore line were not of great length.

A convention of various telegraph admi-A convention of various telegraph aumnistrations was held during the year at Vienna, for altering the existing rules and for lowering the tariffs. The advantage of the latter has already been perceived.

The increased introduction of automatic telegraph instruments is one of the features of the year. A new instrument has been used in France. In this, it is necessary to mark the transmitting band with insulating marks; the receiving instrument records with In England, Sir C. Wheatchemical marks. chemical marks. In England, Sir C. Wheat-stone's automatic instrument has been much used. The transmitting band is perforated by a machine worked by hand, and signals are received at the distant end in the usual Morse code, either by embossed or ordinary ink dots and dashes.

A new feature in telegraphy has been introduced in France, by permitting telegrams to be sent to lighthouses and various coast stations for vessels at sea. The telegrams received are forwarded to the ship by the usual system of flag signalling. The introduction of telegraph stamps into France dates from the present year, and it will not be unlikely that their example will be followed by other countries who do not use them. The use of stamps with us dates many years back.

Sir William Thomson has introduced a marvellously delicate recording instrument, an illustrated description of which appeared in our columns, but at present we are not aware of any practical adoption of it. The use of his electrometer is becoming very general where delicate tests of submarine cables are required to be taken. It is a most valuable addition to his reflecting galvanometer. By the aid of these two, almost all the necessarily useful and accurate tests of a cable can be taken.

Several improvements in batteries have

who, upon this subject, appears to be indefatigable. His investigations are most interesting.

Electricity has added another to its many characters; it has, during the past year, been successfully used for playing upon pianos and organs. It continues to play its part with increasing success in providing communication between passengers, guards, and drivers of railway trains. In railways altoelectricity is now indispensable; electric signalling, being received with more confidence, is largely on the increase

In literature, the past year can only boast of "Frictional Electricity," a posthumous work of the late Sir W. Snow Harris. This may be looked upon as a valuable work. electricians and telegraphists are largely indebted to two books out last year—Culley's "Handbook of Telegraphy," third edition, and Latimer Clark's "Electrical Measurement."

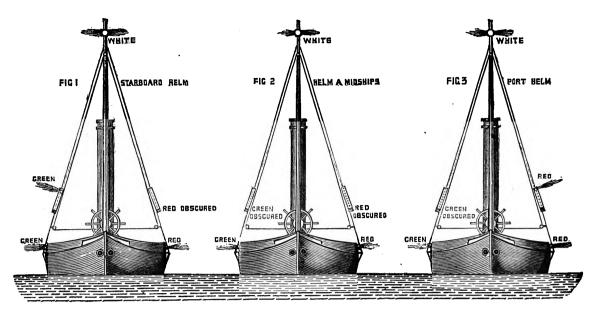
There are many more items of electric and telegraphic progress that, had we space, we might mention; however, enough has been brought before our readers to prove that, with the age, electricity and telegraphy are marching rapidly on, and doing their part well and worthily in the work of human en-lightenment. On the whole, reviewing the work completed and in process of completion, new facts brought to light rendering more clear the mysteries of this intricate science, we are irresistibly drawn to the conclusion that the work so far has been successful, that telegraphy is gradually, and with safe and sure steps, marching on; and that, while there still remains much to be done in the difficult task of clearing the mists from the science of electricity, much has been accomplished during the year to render these mists less opaque, and we doubt not that in the course of time, by dint of the application of mind, assisted by careful experiment, many intricacies in this subtle science will be removed, and the problem of electricity will be simply and satisfactorily solved.

#### JAMES CHALMERS.

WE last week briefly referred to the death of Mr. James Chalmers, whose system of constructing targets promised well for the fortifications of our country. We now place before our readers a sketch of his life, which we know will be read with interest by all.

James Chalmers was one of a number of persevering energetic Scotchmen who, at their outset in life, have possessed little beyond the ordinary education and training, coupled with the indomitable spirit of their country. native of Perthshire, his early days were devoted to gaining his livelihood in one of the branches of the mechanical arts. After some years passed in this country, he resided for some time in Canada and California, and finally settled in London in the early part of 1861. During that year he devoted himself almost entirely to a project for a railway be-tween England and France, with a view to avoid the break formed by the Channel, between the railway system of this country and the Continent. His plan was to have a tube of boiler plate iron, lined with brick work, laid on the bed of the sea, with ventilating towers at intervals; and the pamphlet which he published on the subject attracted general attention, and no small amount of criticism at the time. He exhibited his plans at the International Exhibition of London, 1862, and Paris, 1867, but the amount of capital required, and the difficulties attending so novel and grand a work, have hitherto premiles; Tasmanian cable, 200 miles; for Crown colonies, 5 miles; French Atlantic cable, about 700 miles; total, 1,865 miles. Mr. W. T. Henley—Baltic cable, 320 miles; cables for Norway, Sweden, Italy, &c., 100 miles; total, 920 miles; total, 920 miles. R. S. Newall and Co.—Newcastle and Denmark cable, 340 miles. India-rubber, Gutta-percha, and Telegraph Works Com-

#### READ'S HELM INDICATOR.



many men of first-rate engineering talent, both in France and Britain, have propounded their different schemes for the same object, not one of which has yet been carried into effect, or perhaps ever been subjected to a proper examination. During 1861, various proposals for building ships of war wholly of iron, of iron protected by heavy armour plates, or of effectually protecting wooden-built ships, occupied the attention of the Iron Plate Committee and numbers of scientific and volunteer inventors. Mr. Chalmers was present at a trial which took place at Shoeburyness, in March, 1862, of a target proposed by Mr. Fairbairn, of Manchester. The result of that trial was the destruction of the Fairbairn target, and an examination of the ruins of other targets on the ground, and some in preparation, inspired Mr. Chalmers with the idea that he could improve upon all of them, and he forthwith devoted much of his time to carrying out this idea. Inventors are not always possessed of capital, and the Iron Plate Committee had no funds to assist them—at least, none to give to inventors outside the official circle; but they would give a trial to a target at the inventor's expense. However, Mr. ('halmers, by the kind assistance of Sir S. M. Peto, had one constructed under his own supervision, and it was tried at Sheeburyness in the early part of 1863. The result was that it resisted the shot of the artillery of that time better than any other that had been tried. Since then, the size and power of guns have both been increased, and the Palliser chilled shot have further added to the destructive effect of the guns, when compared with the shot formerly in use. In the mean time, Mr. Chalmers had the mortification to see many of the essentials of his invention copied and embodied in the recent additions to the Navy, without either acknowledgment or compensation; and, notwithstanding all his endeavours, was never able till lately to prevail on the Government to get another target built embodying his invention, to be tried against a Government shield of the same size and weight of metal. In pursuit of this object, and wearied by official delays, his constitution gave way, and during the last eighteen months his health had been far from good, till at last he died on Saturday, December 26, at his residence in Haverstock-hill, London. Let us hope that although he has not lived to witness the success of his new target, the Government will do substantial justice to his memory, and account to his family for any use they have made or may hereafter make of the principles embodied in the Chalmers target.

#### READ'S HELM INDICATOR.

TOTHING can realize so clearly the perils of navigation, and the loss of life from time to time sustained, as a glance at the wreck chart of the Board of Trade. The Goodwin sands and other dangerous portions of our coast are thickly dotted with the fatal crosses; in more open waters more thinly scattered, but marking with more bitter meaning the recklessness, the inattention, the want of security for that sacred possession—human life. The daily papers bring before the public, more or less frequently, instances of wreck and loss of life, which are talked of and forgotten. But in the wreck chart the consolidated evidence of wholesale death is spread out before us. Collisions at sea, so frequent in their occurrence, have yet a sameness in their character which is likely to astonish those who are only casual observers of their cause. On the finest nights, in fog, in storm, and in calm (as when the "Amazon" and "Osprey" came into collision), with a distance of five miles or only of five hundred yards between them, two vessels, seeing each other's lights, bear down upon each other to destroy or be destroyed.

No system of signals, however perfect, can insure the safety of a vessel against the drunkenness of her captain or the insubordination of her crew; and while the recklessness in regard to life, so often characteristic of those who are constantly at sea (whose familiarity with its dangers appears to have created a contempt for its power) exists, collisions will, as a natural consequence, But this is no reason why every care occur. should not be taken to lessen the great total of calamities, and, by a simple and comprehensive code of signals, leave the officer in command without the shelter of the excuse which a contradictory and imperfect system of signals must afford. The defect in the existing code of signals is obviously this—the intention of vessels is not perfectly defined by their lights, and thus the two following articles of regulations for preventing collisions at sea are misapplied. Art. 13 enacts that:

—"If two ships under steam are meeting collisions at sea are meeting to the desired and the steam are meeting." 'end on,' or 'nearly end on,' so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other." Again, at Art. 14, we find -" If two ships under steam are crossing so as to involve risk of collision, the ship which

Holland to Sir John Pakington will illustrate the consequences likely to arise from a misinterpretation of these rules:—"Suppose a vessel, A, has another, B, on her starboard bow, does not the obligation to 'port her helm' put A across the path of B? At times, too, when in darkness or fog, it is impossible to judge of distance, or to know the precise direction of an approaching ship's head, or which way she is steering. At present, it is impossible for two approaching vessels to know when to act under the same rule. A may think that B is 'end on,' or 'nearly end on'; B, on the other hand, may have A two or three points on the starboard side; so the one acts in accordance with Art. 13, and the other follows the instructions of Art. 14, and a collision ensues."

The object of the helm indicator, invented by Mr. George Read, R.N., of the Coastguard, Deal, is to remedy this. In this apparatus an endless line, being taken three coils round the drum of the wheel, passes from thence in an horizontal direction to a pulley on the port side, as shown on the diagram, then proceeding in a vertical direction it goes through a pulley at the masthead, and returns by the starboard side in the same manner to the drum of the wheel. Two lines (dotted on the diagram) pass from this endless line, and are secured severally to the port and starboard lights. The lights are placed in metal tubes, a box at the bottom of each tube concealing the light from sight until, by the vessels being put "to port" or "starboard," it is raised by the movement of the wheel to a higher position in the tube. Only one of the moving lights can, therefore, be visible at a time when the vessel is hard a-port or hard a-starboard, for when the helm is amidships, or the vessel pursuing the course of a line drawn straight along her keel (fig. 2), the two lamps are in equilibrium and totally obscured from sight. Starboard helm raises the green light from its box (fig. 1), and the red sinks out of sight. Port helm raises the red and obscures the green (fig. 3). Retainred and obscures the green (fig. 3). Retaining, therefore, the present fixed port and starboard lights, their relative positions with each other and with the moving lights will indicate the exact position of any vessel at sea. It matters not from what direction she may be coming, as they will show to her the position of any one she may approach. For instance, if A is approaching B end on, or nearly end on, and steering hard a-port, she will show to B two red lights and one green. will show to B two red lights and one green; has the other on her own starboard side shall keep out of the way of the other." The (following out Art. 14), and puts her helm following extract from a letter from Mr. hard a-starboard, she will show two green



lights and no red; if the contrary is the case, she will show two red lights and no green.

At the back of the tube are five holes one over the other, so that the height of the lamp in the tube, and consequent position of the ship, is indicated, not only to the man at the wheel, but to any one on board. If, in the case of collision, the officer in command should be in error in following out the regulations laid down, the tubes being (with the exception of the boxes) entirely open at front, this apparatus will form a register, so that it will require a very unanimous system of perjury (a crime not altogether unknown in Board of Trade inquiries) to overthrow. It will also indicate to vessels approaching from behind the course the foremost vessel is pursuing.

In reference to sailing vessels, an objection has arisen as to squaring the vessel's head sails to obviate this. Mr. Byng Giraud, of Westminster, has suggested the use of an iron standard, on which the tubes might be secured, or of which they might form a part, and the lamps might then be worked up and down by means of a double rack and pinion connected by iron rods to the tiller. The standard might be fixed anywhere on the deck where it would be well in view. This would also prevent any deflection which might take place in the lines. Mr. Giraud has, however, been out with Mr. Read's apparatus in a stiff gale in the Channel, and could detect no unequal action on the lines, but they were most sensitive to every movement of the wheel. To prevent any error as to port and starboard lights, the lamps are so constructed that the port light will not fit into the tube of the starboard lamp, and vice versa. The lights as they appear and disappear in the box, or move up or down in the tubes, have the advantage of flashing lights. The lines passing from the drum of the wheel are a few seconds in their action before that of the rudder chains, so that the direction a vessel is about to take is indicated a short time before the rudder chains act. a vessel is at anchor, both the lights will be in the boxes, and the white light at the masthead alone visible. By day, an arm or sema-phore is used at the mast head with a red flag or ball for the port side, and green for the starboard.

When the collision took place between the "Bhima" and "Nada," in the Red Sea, it was a fine clear night, and the "Bhima," starboarding her helm, was endeavouring, in accordance with Art. 14 (having, we presume, the "Nada" on her starboard side), to keep out of her way. But the "Nada," having seen the "Bhima" end on, or nearly end on, ported her helm (Art. 13), but thinking the ported her helm (Art. 13), but thinking the "Bhima" was endeavouring to cross her as she would in their relative positions have the appearance of doing-suddenly changes her tactics, puts her helm hard a-starboard, and runs into the "Bhima." This, in brief, is the substance of Mr. Lacon's description of this collision, which finds its parallel in numberless cases. Had the "Bhima" known the intention of the "Nada," or had the "Nada" been aware of what the "Bhima" was doing, this terrible collision, with the loss of seventy-nine lives, could only have happened by the most sulpable neglect. We always lay by the printed record of collisions of this kind with the sad conviction of a loss that might have been prevented, and the hazy idea that somehow somebody or something must be wrong somewhere. One thing is certain—that one vessel may be ignorant of the intentions of another until the danger of collision is past recal. Nothing appears to our mind so well calculated to meet the requirements of navigation as the apparatus we have been describing, which is well received by all practical men. It has, we understand, obtained the approval of the Board of Trade and Lloyd's Committee. The President of the Liverpool Mercantile fine magic lantern transparencies produced Shadbolt, most of whom have done some-by this process. Mr. W. England, known for thing to push on their various branches of council of that body have unanimously his capital views of Switzerland, also gives an photographic science.

approved of the invention, after having made practical trials with it, both by day and night. It, therefore, only remains for the shipping interest to avail themselves of the advantages offered by Mr. Read's helm indicator, and to all interested in navigation we warmly recommend the invention.

#### IMPROVEMENTS IN PHOTOGRAPHY. No. I.

VERY good plan is adopted by the photographic journals, of printing a shilling book or "Almanac" at the end of each year, containing articles by experienced men, each of whom summarizes all that has been done during the past twelve months in his parti-cular branch of the art-science. Each com-munication is necessarily brief and to the point, and as competition induces all three photographic periodicals to bring out the best almanacthey can, these little books are of great practical value both to the experienced and inexperienced in photography. purpose to select and condense some of the most valuable information given in these annual publications, beginning with the "Almanac of the British Journal of Photography.'

This annual opens with an article by Mr. John Traill Taylor, the editor giving simple and plain instructions to beginners. The same writer also gives an article on the magic With respect to the use of common lantern. gas in the lantern, he says that although the plan is convenient, not nearly so much light can be thus obtained as from a paraffin lamp. About the best gas flame for the purpose is obtained from two fish-tail burners, one behind the other, and the gas before it reaches the burner should be well charged with some hydrocarbon, such as benzole. respect to the disputed point, whether reflectors in magic lanterns are, on the whole, advantageous, he says that they are, but that most of those in the market fail, because they are not of such a curvature as to make the reflected ray take nearly the same direction as the incident ray. A good reflector, sufficiently true for the purpose, may be made by silvering a circle cut from a blown globe of After being silvered, the reflector can be backed with tin to preserve it from injury. This plan is much better than the use of silvered copper, as the reflecting surface is more perfect, and no cleaning is ever required.

The same writer also gives an article on the coffee process, which has been rising rapidly in favour during the past few months.

The formulæ are as follows:—A large teaspoonful of roasted ground coffee of good quality is put in a teacup about two-thirds full of boiling water. After standing for about ten minutes, the infusion is filtered, and a piece of sugar about the size of a pea is added to it. This is the preservative solution. The plate is coated with rather old and red collodion, and sensitized in a somewhat acid bath. Next, it is washed thoroughly, the preservative is applied in two doses, and, lastly, the plate is dried by dark heat. A full exposure in the camera is desirable. The picture is developed by first bringing out a phantom image by the application of a two-grain solution of plain pyrogallic acid without silver or citric acid, after which the intensification is performed by the addition to the pyrogallic acid of one or two drops of a solution containing about twenty grains each of nitrate of silver and citric acid to the ounce of water. The films have a tendency in this process to slip off the glass, but this evil is averted by running a little dilute albumen round the edge of the plate before coating with collodion. By employing alkaline development, the exposure is very much reduced. We have seen some

article on the coffee process, and recommends plenty of bromide in the collodion used.

Mr. George Kemp, M.D., gives a contribution on the glycerine process, which process was first published by Mr. Valentine Blanchard, and its capabilities very fully tested by Mr. W. H. Harrison. Dr. Kemp research of the contribution of the contrib commends it for lunar and other astronomical photographs, because of the smoothness of the film, and it is also advantageous because in tropical climates it will not let the film dry rapidly, and spoil the plates, as was the case last year while photographing the eclipse of the sun in India. Dr. Kemp says that all uncertainty in the process is removed by a careful selection of pure and quite new honey. There are two varieties of new honey, one almost colourless, contained in cells beautifully white, and the other of a pale yellow or dark brown colour, from an older stock of The nearly colourless variety, he says, is the best, and secures uniformity of results with every fresh stock of preservative. Harrison has an article on the same process, recommending iron development for glycerine negatives, whenever the operator intends to copy his pictures as transparencies for the magic lantern and other purposes. Pyrogallic acid is the best, when the pictures are intended

to be printed upon paper.

Mr. Valentine Blanchard, well known for his instantaneous views of the streets of London, contributes a valuable paper upon instantaneous photography. He says that stantaneous photography. He says that scarely any of the yellow glass windows used by photographers are non-actinic enough for very rapid processes; to make the glass safe it is best to paste over it some orange tissue paper, which must afterwards be varnished to increase its transparency. The nitrate bath, strength forty grains to the ounce, must be made of the purest nitrate of silver, several times crystallized. The filtering The nitrate The filtering paper must, of course, be pure. Highly bromized collodion is necessary. The developer consists of thirty grains of photosulphate of iron, and fifteen minims of very pure acetic acid, to each ounce of water; alcohol is not necessary in the developer, because the sensitiveness of the bath rapidly falls off after a few dozen plates have been immersed in it, so that it has to be put aside for ordinary photographic work, before it is much charged with alcohol from the collodion. One very essential point in instantaneous photography is to leave the developer on the plate as long as possible, to bring out detail in the shadows.

Mr. R. J. Fowler calls attention to a new photographic paper, which will keep a very long time without spoiling before use. prepared with carbonate instead of chloride of silver, and is rendered sensitive while in the printing frame by placing pads behind it, well saturated with ammoniacal vapour. The entire success of printing depends upon excess of ammonia.

Mr. Howard Grubb, C.E., contributes a paper upon astronomical photography, with details of the method he adopted to photograph the moon with the great reflecting telescope made by himself for the Government of Australia. Mr. Warren De La Rue's reflector gave an image of the moon 14 in. in diameter, whereas the Melbourne telescope gave a lunar disc 3 in. in diameter.

The valuable little publication now under notice contains also contributions by Dr. Emerson Reynolds, Dr. Hermann Vogel, Dr. George Markham, Mr. P. Le Neve Foster, George Markham, Mr. P. Le Neve Foster, M.A.; Messrs. J. R. Johnson, A. L. Henderson, E. W. Foxlee, J. Werge, A. Pumphrey, J. Bocket, J. Homersham, G. C. Warren, M. Carcy Lea, W. Griggs, Walter Woodbury, F. Howard, Samuel Fry, E. Dunmore, R. Vevega, C. E. Pearce, E. Cocking, H. Swan, J. Beattie, F. W. Hart, Ernest Edwards, W. H. Davies, Edwards, Parent and Congression. W. H. Davies, Sylvester Parry, and George

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#### RICHARDS' INDICATOR.

LTHOUGH Richards' steam engine indicator is an instrument pretty generally known, it is worth bringing prominently before our readers, not only on account of its own intrinsic merits, but in connection with a new edition of Mr. Porter's valuable treatise\* upon the subject. In preparing this new edition, the author has given considerable attention to the application of the indicator as a means of showing the degree of condensation and consequent re-evaporation in the cylinder. He has also carefully gone into the influence of the reciprocating parts of the engine upon the distribution of the pressure on the crank, and has given the method of obtaining a diagram representing this pressure correctly at every point of the stroke. Tables are given of the properties of saturated steam at temperatures from 32deg. to 213.07deg. Fah.; also of saturated steam at pressures from one pound to two hundred pounds on the square inch, and of steam at pressures of one to fourteen atmospheres. The tables of the properties of steam are compiled, as far as respects temperature, pressure, and total heat, from the memoirs of M. Regnault. The volume is illustrated by indicator diagrams in white on a black ground, and are perfect specimens of this style of illustration.

For the information of those who may yet be unacquainted with the Richards' indicator, we append the following particulars, referring our readers to the engraving of the instru-ment on page 21. This indicator has this distinguishing feature, that the throw of the piston is only one-fourth that of the pencil, while the latter still moves in a vertical line. By this means, the defects common to all other forms of this instrument, and which arise from necessity of using a long, weak, and tremulous spring, and of employing heavy reciprocating parts, which must have a considerable motion, are avoided. They have been used with complete success on locomotive engines, running at a speed as high as 260 revolutions per minute, and, indeed, it is found that there is not any practicable speed at which they will not give per-fectly correct indications. These instruments are manufactured by Messrs. Elliott Brothers, of 449, Strand, London, who make the springs to ten scales, as follows:—

No.	1.	sure or in. In	ts 1 n th	lb. ie s	q	res- uare	— <b>1</b> 5	to +	10
"	2.	-1-12th					15	,, +	22
"	3.	1-16th					15	,, +	35
"	4.	1-20th					15	,, <del>+</del>	47
"	5.	1-24th					15	÷	60
"	6.	1-30th					15	,, +	80
"	7.	1-32nd			1	\tmos	phere		100
"	8.	1-40th					٠.		125
"	9.	1-48th						· +	150
	LO.	1-56th					•	<b>"</b> , +	

Spring No. 1 has been specially adapted to indicate the vacuum on a large scale, in engines or pumps which work at high pressures. It is important to know that all the springs will fit every instrument, and they can be readily changed by any one. The can be readily changed by any one. size of the diagram is 3 in. + 5in. drawn on metallic paper, by a pointed brass wire. The piston has an area equal to onehalf of a square inch. This is double the size usually employed, but it is the smallest that will ensure accuracy in the diagram. A special attachment, enabling the instrument to be applied to oscillating cylinders, has been arranged by the manufacturers.

ON RECENT SCIENTIFIC DIS-NOTES COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

THE EFFECT OF COLD ON METALS—A DURABLE COVERING FOR STAIRCASES—THE DENSITY OF ALLOYS OF COPPER AND TIN—SOME NEW DIS-COVERIES IN CHEMISTRY-THE ELECTRIC SEWING MACHINE.

NHE effect of extreme cold on metals, and particularly on iron, has often been remarked in this country. The axles and springs of railway carriages are known to be much more liable to fracture during a severe winter than at other times. Other metals, too, are more or less affected by cold. The leaden pipes which burst with the frost would no doubt bear a much greater strain at a higher temperature, when the metal would simply expand with the pressure. On tin, however, the effect of great cold is much more marked. Some pigs of Banca tin exposed last winter at St. Petersburgh underwent a most remarkable change. The metal became fibrous, and deep fissures were produced in various directions. Fritsche, who details the circumstances, mentions that the phenomenon had been observed before in Russia, once in the case of the pipes of a church organ which were cracked and rendered useless by the frost, a fact which shows that organs built for cold countries should be well cased. In the instance of mercury, it was stated by M. Dumas, that the frozen metal, when brought to a much lower temperature than its freezing point, undergoes a remarkable change in its mole cular state. Cold means condensation, and no doubt produces some change in the form and arrangement of the ultimate particles of the metal whereby its physical properties are considerably modified.

The wear of staircases is often a very serious matter. Whether of wood or stone, with much usage, they soon go. If of stone, the roundness of the edge soon wears away, and people miscalculate and stumble. If of wood, they are much sound down. To save them, we resort to many devices. If of wood, they are much sooner worn We cover them with lead, which, soon wearing into holes, leaves ragged edges, which catch ladies' dresses and make similar ragged edges. Or we put a thick bar of brass along thom, which sometime catch the heel of a man's boot and send him head-long down stairs. The facts being so, a really lasting and serviceable protection to staircases is a desideratum. Such a covering, M. Cazeau says he has found in thin plates of aluminium bronze. For some time, it seems, the ascent of the column in the Placo Vendôme has been interdicted to the public because of the wearing away of the stairs. It is for these that M. Cazeau proposes his covering, and if what he says is true, that the experiment has been made in a factory (it must have been a very busy one), where plates of common bronze on the stairs in thick were worn out in six weeks, while plates of aluminium bronze in thick remain just the same as when new, after eleven months of service, it is an invention which must command notice. Aluminium bronze is not too expensive if it will bear this amount of usuage; and we recommend the authorities of the Metropolitan Railway to give it a trial in place of the objectionable bars of brass to which we have alluded. Our readers will remember that aluminium bronze is merely

copper with from 8 to 10 per cent. of aluminium.
While speaking of alloys, we may mention the fact of interest to the history of these compounds mentioned by M. Riche, that the real density of the alloys of copper and tin is always greater than the alloys of copper and this always greater than the calculated density, when the proportion of copper does not exceed that required by the formula Cu<sub>3</sub> Sn<sub>5</sub>. If a larger proportion of copper than this be employed, the greatest density is observed in the case of an alloy formed of one equivalent of tin and three equivalents of copper, which is not far from the gun metal used for guns of the largest calibre.

Two or three very interesting facts in chemistry may be shortly mentioned. M. Cailletet has been studying the influence of pressure on chemical action, and, amongst other results, has found that the evolution of hydrogen by the action of water, sulphuric acid, and zinc, coases at a pressure of 170 atmospheres. Thus the disengagement of a gas under such circumstances is a phenomenon comparable to that of ebullition.

Berthelot. He placed two porcelain tubes one within the other in a furnace, which were thus exposed to the same temperature. In the outer, he placed a mixture of sulphur and carbon, and thus obtained bisulphide of carbon. Through the other but smaller tube he passed the vapour of bisulphide of carbon, and found that the two elements were dissociated or separated.

Fritsche has examined the physical properties of two solid hydrocarbons from coal tar, and finds that in the crystalline state they exhibit in an eminent degree the phenomenon of fluorescence, but once fused they entirely lose the property.

We have already mentioned the invention of a sewing machine driven by electricity. Such a machine may now be seen in actual use in Paris. The foot is now no longer needful; the "hand" has only to direct the work of the needle. The invention, although the machine can only be adapted for the lightest work, may be worthy of attention here. We do not know whether or not it is protected by a patent; but in any case the arrangement for producing the movements will be familiar to every electrician.

#### THE SMITHFIELD CLUB SHOW.

N our notice of the above exhibition in December last, we were under the necessity of directing attention to the circumstance that not only had we not been accommodated with the usual admission to the private show, but that our written applica-tion remained unnoticed, whilst the personal application of our representative was not only treated in as unceremonious a manner. We find that we were not alone, a contemporary having been treated in a similar manner. We will let the "Ironmonger' tell its own tale, which, with our own, we are sure the Royal Agricultural Society—under whose auspices the show is held-will not like to see

repeated noxt year. Says our contemporary:—

Before an exhibition is thrown open to the public, repeated next year. Says our contemporary:—

Before an exhibition is thrown open to the public, the writers for the press are invariably admitted to a "private view," in order that they may examine the objects exhibited without inconvenience. The managers of the exhibition know the value of good reports, and are usually anxious to afford journalists an opportunity of taking full notes. Unfortunately, their good intentions are occasionally frustrated by fussy Jacks-in-office who destribute the presstickets. A case in point came under our own notice in connection with the recent show of cattle and implements at the Agricultural Hall. An application for tickets to admit the editor of the "Ironmonger" and a reporter to the private view having elicited no reply, we waited on the proper officials, and reminded them of the application. We went, not as private individuals craving a favour, but as the representatives of a well-known class journal, which has become an important medium of intercommunication for the makers and vendors of agricultural implements. Had we attended as the representatives of the "Halfpenny Herald," the "Bethnal Green Democrat," or the "Petticoat-lane Scarifier," we might possibly have been welcomed as worthy members of the Fourth Estate. As it was, we were informed that there were no more press tickets, in a manner that convinced us that there was no more courtesy, or even decency, at the disposal of one of the chief officers. Next year, it is to be hoped that the directors of the Show will provide for the admission of those reporters whom the exhibitors expect to see, and take care to remind their officers that civility costs nothing.

#### HERRING'S WARMING APPARATUS.

THE object of this apparatus, illustrated in our engraving, and manufactured by Messrs. Herring and Son, of Chortsey, is to utilize a portion of the heat of waste steam in warming buildings, and at the same time to condense the steam for the boiler feed. The waste steam comes from the engine by the pipe A, passes through the coil, becomes condensed, and passes out at B. The becomes condensed, and passes out at B. The water in the cistern is thus much heated, and passing out by the pipe C, which is part of an ordinary system of hot water pipes, circulates round the building, and returns to the tank by D.

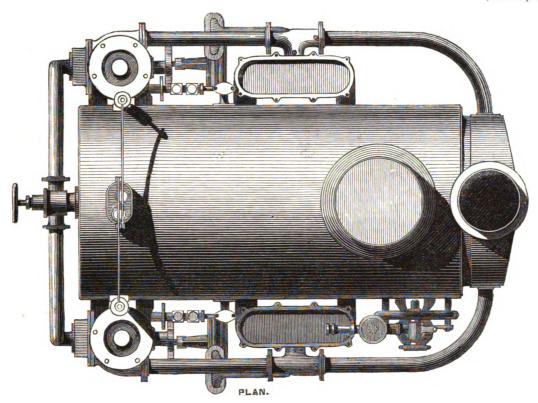
Two or three very interesting facts in chemistry may be shortly mentioned. M. Cailletet has been addying the influence of pressure on chemical etion, and, amongst other results, has found that no evolution of hydrogen by the action of water, alphuric acid, and zinc, ceases at a pressure of all will be represented and considered irrespective of the various shades of individual opinion. No pains nor expense have been spared in getting up this paper, which presents a pleasing appearance. It is conducted in an able manner, and deserves to—as it doubtless will—take a prominent position in our scientific literature. "THE ARCHITECT" is the title of a journal which



<sup>\* &</sup>quot;Description of Richards' Improved Steam Engine Indicator, with Directions for its Use." By CHARLES T. Porter. London: Longmans, Green, Reader, and

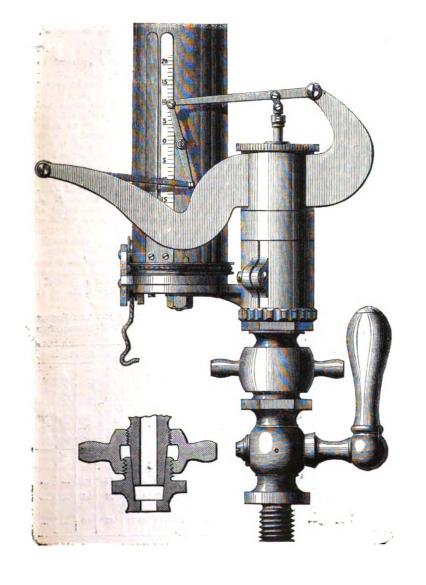
# HIGH PRESSURE STEAM LAUNCH WITH SURFACE CONDENSERS.

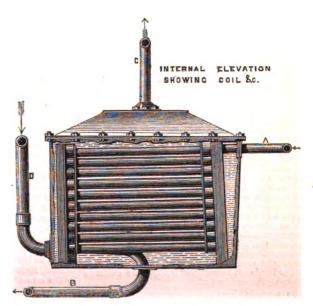
(For description, see page 25.)



RICHARD'S INDICATOR.







INTERNAL PLAN

#### ARTILLERY EXPERIMENTS IN AMERICA

THE trial of guns against forts, commenced at Fort Monroe, was continued at Fort Delaware, on Wednesday, December 3. The target in this case was one of the casements of the fort itself, reinforced with a shield of iron. This shield was formed of two armour plates, one 8in. in thickness, and the other of 7in. The two plates were bolted together, one over the other, and supported by a framework or bracket of iron plates 2in. thick. This shield was inserted into the embrasure without being set into the masonry. It was supported by placing the brackets upholding the armour plates against piers of masonry, built in the place of the arches, connecting the casemate selected for trial with those on either side of it. These two arches had been built up solid to a depth of 8ft. from the inner face of the wall of the casemate; thus practically doubling the thickness of that wall, making it 16ft. thick, instead of 8ft. thick. THE trial of guns against forts, commenced at Fort of 8ft, thick.

of 8ft. thick.

The trial began with three shots, directed against the iron shield. The first of these shots was from a 12-inch rifled gun, with a chilled iron shot, weighing 623lb. This shot was fired with a charge of 64lb., the range in this and all other firings being assumed as 500 yards, and the charge being graduated accordingly. This 12-inch shot struck on the left of the shield, about 1ft. from the edge or the embrasure. Though the actual penetration was only 3in, the shot knocked a jagged hole, of about 1ft. square, in the edge of the embrasure, sending a piece of the inner plate, weighing some 700lb., flying into the sand-pit in the interior of the gun-room. The shot itself broke up, and a piece of it was left sticking in the shield, which was forced back some three-quarters of an inch. The piece of the inner plate, in flying back, knocked off a piece of the angle iron joining the shield to the bracket, and two bolts were broken by the shot. The second shot struck in the right-band leaves correct the shield it interest the shield it. the shield to the bracket, and two bolts were broken by the shot. The second shot struck in the right-hand lower corner of the shield. It indented the outer plate 4in., and cracked it about 6in. to the right of the centre of the ombrasure. It knocked off from the inner face of the rear plate a piece about 18in. square and 2in. thick, and broke and bent the angle-iron. The inner plate, we omitted to say, was formed of two plates, set one above the other. A crack was started in the lower of these plates, which ran to the edge of the upper. Two bolts were also broken by this shot.

The third shot struck 2ift. above the point of impact of the second shot. Its indent was 2jin.. and the plate was bent in around the shot, to the depth of 1ft. The front plate was badly cracked between the bolts, and the rear plate had a piece 18in. square knocked off of it, on the inner side in front of the shot. knocked off of it, on the inner side in front of the shot. It was also badly cracked down to the point of junction with the lower plate. The shield was forced back by these three shots directed against it, to an average distance of 3in.; the brackets were slightly loosened from the pieces supporting them; the right bracket separated from the shield and driven back 14in., and the pier of masonry at the side of the right bracket was forced back bodily lin. These last two shots were from the 15-inch gun, with 84 1-3lb. of powder. The first shot was of steel, weighing 483lb., and the second of cast iron, weighing 452lb. Six shots were subsequently fired from the same gun and with the same charge. These were 450lb. to 455lb. in weight, and were of cast iron, with the exception of the last one, which was of steel, and weighed 485lb. All of these shots were directed against the masonry on the left-hand of the embrasure. One of them struck the counterscarp, ricochetted, flew over masonry on the left-hand of the embrasure. One of them struck the counterscarp, ricochetted, flew over the edge of the outer plate of the shield, which did not cover the inner plate entirely to the top, struck the inner plate, and split it down to the embrasure, and knocked both brackets back 22in. and separated them entirely from the shield. The other shots struck fairly against the masonry, and cut it down on the outer face to an average depth of 7ft. The masonry was also knocked away over the shield, and through the opening thus made, and through the embrasure, pieces of the masonry flew into the casemate. Other pieces of the masonry were knocked off the inside of the wall, and fell into the casemate adjoining the one fired at.

adjoining the one fired at.

As a whole, however, the masonry stood better than it did at Fort Monroe. The impact of the shot was more localized in its effect, and the superior solidity of the structure was otherwise apparent. This trial, as a whole, was no more reassuring to forts and their builders than the one at Fort Monroe. Though the masonry stood better here, the ixon did not do so well, and was apparently of not so good a quality. The casemate fired at was, as in the former case, reduced to a condition which would not make it an inviting place for gunners. Some of the damage could have been prevented by the addition of an inner lining; but we do not see that this would have materially affected the result. Our engineer officers have put our existing fortifications to a severe test in these two experiments. If they had any doubts before as to their value, they can have none now.

Some of these officers, at least, are able and fair-minded men, and we have no doubt that they will be able to turn their recent experience to good account.

The problem before them is a difficult one: but The problem before them is a difficult one; but they have set themselves resolutely to work for its solution. Let them not be too closely bound by the apparent necessities of their position. These are revolutionary times, and the change in all the conditions of attack necessitates a correspondingly radical change in all the conditions of defence. There is a great reputation in store for the man who shall solve the problem of detence. Though engineer officers the world over are at work upon it, we venture our "guess" that, if the problem be solved at all, it will be by a Yankee.—U.S. "Army and Navy Journal."

#### THE WIGAN COAL TRIALS.

(Concluded from page 7.)

#### 3. PERMANENT TRIALS AND THEIR RESULTS.

VHE preliminaries just described having been determined, fifteen coals, selected by Her Majesty's inspectors of mines, Joseph Dickinson, Esq., and Peter Higson, Esq., were then submitted to trial seriatim. The following is a list of their

Hindley Yard. Worsley Top Four Feet. Upper Crumbouke. Lower Crumbouke. Upper Three Yards Six Feet Rams. Great Seven Feet. Blackrod Yard.

Pemberton Little Delf or Two Feet Mine, and Pemberton Four Feet Mine, where the two are so near together as to form one seam.

Haigh or Arley Yard.

Furnace Mine.

unnecessarv

Bickerstaffe Four Feet or Blangate Mine. Rushy Park and Little Delf Mines, worked simultaneously and mixed.

Ince Three Feet, Four Feet, and Seven Feet Mines, worked simultaneously and mixed.

Arley Mine. Although it had already been found that thick firing gave better results than thin, yet as the whole of the preliminary trials had necessarily been made with one coal for the purposes of comparison it was thought desirable to test all the coals on the list with various thicknesses of fires rather than to assume they all required precisely the same treatment, and therefore they were tried with fires 9in. thick, and then with 12in. thick, the latter being thought at first the greatest thickness permissible, but experience showing that 14in. fires could be managed, additional samples of the coals, where necessary, were procured, and further trials made with 14in fires. Added to this, a longer trial was made, in which 1,500lb. of coal was burnt instead of 1,000lb., as in others, in order to see how far the coal would maintain its efficiency in a long run. Also the effect was tried of closing the perforations in the firedoors as an indication whether too much air has been admitted or not. In all the trials just named the "coking" system of firing was adopted, but an additional one with "spreading" firing 12in. thick was made as a comparison, and as it was found in all cases that coking firing proved to be the most economical, further trials on the spreading system were thought

The result of these trials showed that the coals possessed a very high evaporative power combined with great speed; one coal evaporating 11:101b. of water, at 100deg. per lb. of coal; a second, 11·15lb.; a third, 10·49lb.; a fourth, 10·91lb., &c., &c.; while in the case of the first, 46·17 cubic feet of water were evaporated by the boiler per hour; in the second, 48·60 cubic feet; in the third, 51·34 cubic feet; in the fourth, 45·37 cubic feet; while only a little faint smoke was occasionally visible. These results were very superior to those reported to the Admiralty in 1849 by Sir Henry De La Beche and Dr. Lyon Playfair, who returned the economic evaporating power of the best of the Lancashire coals as only equal to 8lb. of water at 100deg. evaporated by 1lb. of coal. The results obtained from the South Lancashire and Cheshire coals were found to compare very favourably with those water, at 100deg. per lb. of coal; a second, 11.151b.; were found to compare very favourably with those obtained from the North Country and Welsh coals at Her Majesty's dockyard, Keyham, but it was thought it would be of further satisfaction to, try the Welsh and Newcastle coals in the Wigan boiler for comparison and this was therefore does. for comparison, and this was therefore done. results will be more readily seen if arranged in the form of a table, as follows:-

COMPARATIVE TABLE OF THE RESULT OF THE TRIALS OF THE NORTH COUNTRY, THE WELSE, AND THE SOUTH LANCASHIRE AND CHESHIRE

ı.						
s		leg.	per		kep	.hou <sup>r</sup>
e - l a e s r l	NAME OF COAL AND PLACE OF TRIAL.	lbs. of water at 100deg' ovaporated per lb. of coal	Cubic feet of water 100deg. ovaporated bour.	Minutes of Very Light.	Minutes of Brown.	Minutes of Black.
	NORTH COUNTRY COAL. Davidson's mixed with Hast- ing's Hartley, in equal quantities. Tried at Key- ham. Ditto. Tried at Wigan	10·71 10·71	43-00 51-33	3·4 1·3		:::
2	WELSH COAL.  Powell's Duffryn mixed with Nixon's Navigation and Davis's Aberewomboy, in equal quantities. Tried at Keyham	10-14 11-15	38·60 48·60	3·1 1·7	:::	
	SOUTH LANCASHIRE AND CHESHIRE COALS. Hindley Yard coal. Tried at Wigan Lower Crumbouke coal. Tried	11·10	46-17	0.2		•••
	at Wigan	11·15 10·49	48 60	1·8 5·9		•••
ı	at Wigan	10-49		2.4		•••
	Haigh Yard coat. Tried at Wigan	11-24		0.5		•••
٠						

Detailed results of the permanent trials of the whole series of coals, when treated on the coking system, with the fires 14in. thick, and the perforations in the doors intermittently open-which were the conditions that afforded the highest resultswill be found in the tables appended; but as the detailed tables c. the remaining trials—made under various conditions as to the thickness and treatment of fires, admixture of air with the gases, and length of experiment—occupy as many as thirty-eight sheets, it was found impracticable to include them in extenso in this report, but the condensed results are subsequently given.

When all the coals on the list had been tested, When all the coals on the list had been tested, and the results given in the tables just referred to arrived at, the Admiralty sent down two of their officers, Robert Nicoll, Esq., R.N.. Assistant to Chief Engineer at Her Majesty's dockyard, Keyham, and William Lynn, Esq., Assistant Inspector of Machinery at Her Majesty's dockyard, Portsmouth, to witness a repetition of the trials and report thereon. report thereon. A table giving the results obtained by the Admiralty officers will be found on sheet No. 2. All the trials hitherto referred to were made with the natural chimney draught, but it was thought well for the Admiralty officers to witness a second series with the draught quickened by mechanical means, and therefore a steam jet fed by an adjoining boiler at a pressure of 30lb. per square inch was applied to the chimney. A table giving the results of this second series of trials by the Admiralty officers will be found on sheet No. 2a.

To facilitate a comparison between the results of the original series of trials and of the verifica-tions by the Admiralty officers, sheet No. 3 has been prepared, which gives in parallel columns the net results of the different trials of each of the coals on the list, while the following table gives the mean of the whole:-

TABLE OF THE MEAN RESULT OF ALL THE SOUTH LANCASHIRE AND CHESHIRE COALS EXPERIMENTED

	, o o	per	per t of	Smo	ke p	hou
CHARACTER OF TRIAL.	Lbs. of Water at 100deg. evaporated per lb. of Coal.	Cubic Feet of Water 100deg. evaporated 1 hour.	Lbs. of Coul burnt per hour per square foot of firegrate.	Minutes of Very Light.	Minutes of Brown.	Minutes of Black.
Mean results of all the coals tried by Dr. Richardson and Mr.						
L. E. Fletcher Ditto verified by Ad-	10-35	47-22	27	2.4		•••
nitralty officers Ditto with steam jet	10.68	48-80	27	1.1	•••	
tried by Admiralty officers	10-18	69-13	41	0.0		

<sup>\*</sup> See MECHANICS' MAGAZINE for December 18, 1868, page 487.

This table shows that the Admiralty officers more than verified the results previously given, and in reporting to the Admiralty thereon they stated that such is the case.\*

Further to test the value of the coal, it was thought well to have a trial at sea, and therefore a run was made with the "Lindsay," a screw collier of 800 tons burden, fitted with two boilers, each containing three furnaces and driving a pair of engines having a diameter of 28in. in the cylinder, making 701 revolutions per minute and indicating about 460-horse power. The trial was most satisfactory; coking firing, as already explained, was adopted and carried out by the ordinary ship's stokers, and Messrs. Nicoll and Lynn report that steam "was kept blowing off at the waste steam pipe all the time of the trial, while no smoke was visible during the whole of the four hours' run."† The commissioners close their report with the following words:—"In conclusion, these experiments, including that of the 'Lindsay,' show that when the products of the coal are consumed, which we consider can be easily done by careful firing, the coals of this district have a high evaporative value, combined with great speed, and are in every respect fit for Her Majesty's Service.

To assist in estimating the advantages of different thicknesses of firing, sheet No. 4 has been prepared, which gives the results of firing each coal with a thickness of 14in., 12in., and 9in. The following table gives the mean results of the whole number of coals at each thickness of fire:—

COMPARATIVE TRIAL OF THE RESULTS OF DIF-FERENT THICKNESSES OF FIRES.

	deg	r at per	per of	Smoke p.hour			
CHARACTER OF TRIAL.	Lbs. of Water at 100 evaporated per lb. coal.	Cubic Feet of Water 100deg. evaporated 1 hour.	Lbs. of Coal burnt hour per square foot fregrate.	Minutes of Very Light.	Minutes of Brown.	Minutes of Black.	
Mean Results of all the Coals, with Coking Firing. Fires 14in. thick	10-35 10-06 9-65	47·22 45·67 44·00	27 27 27	2·4 2·8 1·0	:::		

From this it will be seen that a fire 14in. thick gives a more economical result than one 12in. or 9in. thick, while no diminution of speed is experienced. To show that "coking" firing coupled with the admission of a little air above the bars immediately after charging, which is the smokeless system, is not attended with any loss in economy, sheet No. 5 has been prepared, which gives the result of three different systems of treatment applied to each coal:-1. The coking system coupled with the admission of sufficient air above the bars to prevent smoke. 2. The "coking" system with perforations in the fire-door closed; and 3. The "spreading" system with the perforations in the firedoor after charging.

The following is the mean result of each of the three systems :-

COMPARATIVE TABLE OF THE RESULT OF FIRING ON THE COKING AND ON THE SPREADING PRIN-CIPLE, AND ALSO OF ADMITTING AIR AT THE FIREDOOR OR NOT.

	og.	r at per	per of	Smo	ke p.	hou
CHARACTER OF TRIAL.	Lbs. of Water at 100d evaporated per lb. Coal.	Cubic Feet of Water 100deg, evaporated hour.	Lbs. of Coal burnt hour per square fool fregrate.	Minutes of Very Light.	Minutes of Brown.	Minutes of Black.
Coking firing with fires 12in, thick. Perfora- tions in firedoor open after charging	10-13	46:36	27	3.2		
Coking ditto with per- forations constantly closed	9-75	47-03	29	12-6	1.4	0.6
door open after	9:51	51.37	32	20.8	5.3	4.2

See Paragraph 12 in report of Messrs. Nicoll and Lynn to the Admiralty on the steam coals of South Lanca-bhire and Classhire, dated 1867.
 See Paragraph 17 Messrs. Nicoll and Lynn's report.

A consultation of this table will show that there is no loss in economy from adopting the smoke-less system of firing, but, on the contrary, a slight though there is a loss of speed, neither as much coal being burnt per square foot of fire-grate nor as much water evaporated per hour from the boiler. Thus the table shows at once the advantage and difficulty of smoke prevention. experienced It is feared that difficulty will be wherever boilers are overtasked, while it will be seen that the table affords an explanation of the objection entertained by firemen to admitting air above the firebars when they want to raise steam quickly.

On making a longer trial, that is to say, consuming 1,500lb. of coal instead of 1,000lb., and running for an average length of time of 5hr. 9min., instead of 3hr. 27min., the result was slightly inferior in economy, though practically equal as regards the amount of water evaporated by the boiler per hour and the absence of smoke. The precise figures are given in the following

COMPARATIVE TABLE OF THE RESULT OF SHORT AND LONG TRIALS.

-	trial.	con-	100deg. lb. of	per per	per of	Smok	e p.h	our
CHARACTER OF TRIAL.	Average length of tri	Amount of Coal c sumed.	Lbs. of water at 100c evaporated per 1b. coal.	Cubic feet of water 100deg. evaporated hour.	Lbs. of coals burnt hour per square foot firegrate.	Minutes of Very Light.	Minutes of Brown.	Minutes of Black.
Short trial	h.m. 3-27	1,000	10-29	46.81	27	2.4		
Long trial	5-9	1,500	9.76	45:71	28	2.0		

It may be added that in this series of trials the fires were treated on the coking system, as before, and that in some cases they were 14in thick, in others 12in., and in one 9in.—care, however, being taken, in queting the result of each coal, that the thickness of fire should be the same in the short trials as in the long, so that the comparison is a correct one,

Such is a very brief account of the series of trials of the South Lancashire and Cheshire coals. will be seen, however, that these coals have a high evaporative value combined with great speed, some of them as returned by the Admiralty officerswho were sent down to investigate and reportbeing able to evaporate 11.3lb. of water at a temperature of 100deg. per lb. of fuel at a speed of 26lb. of coals consumed, and 4·7 cubic feet of water evaporated per square foot of firegrate per hour, while the mean of the fifteen coals tried, gives an evaporation of 10.68lb. of water at 100deg. per lb. of fuel at a speed of 27lb. of coal burnt and 4.6 cubic feet of water evaporated per square foot of firegrate per hour.

Since these trials, as previously stated, had special reference to the suitability of the South Lancashire and Cheshire coals for use in Her Majesty's Navy. round coal was used almost entirely, and not slack. These trials, therefore, do not exhaust the whole subject of the economy of fuel with regard to mill purposes, yet it is thought there are several points in them which are of general interest, and that the circulation of information with regard to them will prove of assistance to the ordinary steam user. It is of interest to note that the free burning and gaseous coals of this district were burnt in these trials with the entire absence any smoke beyond the faintest trace, and that this was accomplished both at sea and on land, and that, not by means of any special apparatus, but simply by careful firing, accompanied by the admission of a little air through the firedoor, for a short time after charging. It should also be noted that economy was the result of this smokeless system of firing, and of the admission of air through the firedoor; also that thick fires were found to be more economical than thin, and short firegrates than long ones, and though due regard must be had to the amount of steam required, yet it is thought the nreguests mill boilers are, as a rule, too long.

L. E. FLETCHER. yet it is thought the firegrates in ordinary use in

A series of valuable sheets of tabulated results are appended to Mr. Fletcher's report, but for which we are unable to find space.

LONDON ASSOCIATION OF FOREMEN ENGINEERS.

THE sixteenth annual meeting of members took place on Saturday, the 2nd inst. It was ex-

ceedingly well attended, and the chair was occupied by Mr. J. Newton. moment consisted in the The first business of presentation of balance sheet of the last half year, and the report thereupon of the auditors—Messrs. Irvine and Bulleugh. From these documents we gather that the Association, in spite of the continued depression of trade, is in a satisfactory condition, numerically and financially. The number of ordinary members and financially. is 104, and of honorary members 64—total, 168. The general fund, invested or in hand, amounts to £429 2s. 11d., and the superannuation fund the interest upon which only is available for the partial support of decayed foremen—equals £903 18s. The fund for the solace of widows and orphans is very minute, amounting to £10 only. It is subscribed to homeopathically, to all appearance, by ordinary members solely. During the past year, £103 were paid to unemployed associates, and £33 as solatia to the families of those who died in the same period.

The balance sheet and report were, after some discussion, unanimously accepted. Mr. Briggs having explained the nature and agreeable results of his visit to the Leeds Association of Foremen, which, too, is in a thriving condition, Mr. Newton proceeded to deliver the president's annual address. This was of considerable length, and of much interest, but it is not possible for us at present to give it in extenso. After alluding to the gratifying fact that the Institution is steadily progressing and gaining more and more the countenance and support of employers, Mr. Newton furnished biographical sketches of Messrs. Tomlinson and Clark, two associates, whose deaths occurred in 1868. Mr. Tomlinson was foroman of boiler makers at the Royal Dockyard, Woolwich, and Mr. Clark, foreman of moulders to Messrs. Maudslay, Sons, and Field. Details were given of their professional careers, of their personal characteristics, and of their scientific acquirements. It was (observed the president) a matter of regret that the materials for these biographies were scanty, although it was known that both associates had passed through many vicissitudes. "Were we one and all to keep diaries, and make careful note of our labours, our cares, our hopes, our fears, our disappointments, and of our triumphs over difficulties, what interesting and valuable memoirs might not be written by kindly hands of the foremen engineers?

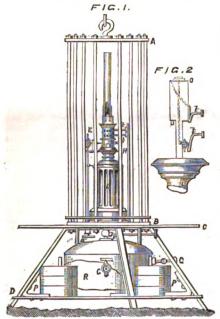
Turning next to the Association itself, the president reviewed its proceedings in the past, and indicated what he considered should be its course in the future. The early efforts made for its establishment had been well sustained by its founders, and the Institution was at that moment healthy and vigorous. Energy and activity, however, on the part of every member were essential ever, on the part of every memory more for the promotion of its future prosperity. Apathy was the evil to be contended against—the palad which must be removed. "Let but rock ahead which must be removed. "Let but the intellectual strength and the practical know-ledge of the associated foremen be put forth and developed in the lecture room as they were in the factory, and their society would take a high place in the estimation of scientific men of every grade. From a knowledge of the materials of which the Association is composed, I am inclined," said Mr. Newton, "to predict that a day will come when the affixing of the initials F.E., as constituting membership, will entitle those who use them to an amount of consideration second only to that accorded to the C.E. and the M.E. It rests with members themselves to achieve this elevated position for the Association.'

The necessity of increasing largely the facilities for technically instructing youth intended for the workshop was dwelt upon with much emphasis, and at considerable length, and Mr. Newton concluded his remarks by thanking members generally for the uniform kindness he had experienced on all occasions at their hands. His tenth year of office had now expired, and, as an old hand, he trusted he might retire into private life with a "fair" certificate. Retirement, however, was not allowed to the president on this occasion, for Mr. Newton was at once re-elected to the office on the motion of Messrs. Hosken and Keyte, the two oldest mem-Mr. Keyte was re-chosen as vice-president; Messrs. J. Irvine, Cutler, and Dewer were appointed members of the Committee; and Mr. Edmonds, of Woolwich Arsenal, was elected as auditor for the ensuing half year. With a vote of thanks to Mr. Newton for his address, the business of the evening came to a close.

We have since learnt, with much satisfaction, that Joshua Field, Esq., C.E., has consented to preside at the anniversary banquet of the Association on February 20.

#### SUBMARINE LAMP.

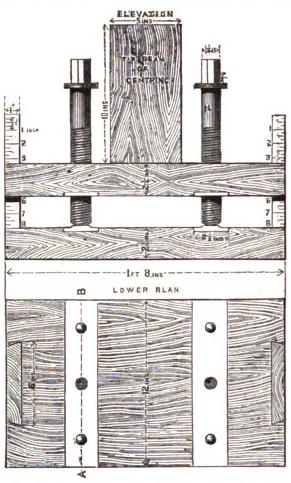
THAT, in some instances of explosions in mines, the safety lamp has not been a protection in times of danger, there is abundance of evidence to testify. We do not allude to cases where the lamp was opened or otherwise tampered with by the miners themselves, but to those where, in fact, the lamp failed to discharge its own duty. Not only in mines are other than the ordinary means of illumination required, but also in those situations where engineering and constructive works are carried on by night under water. Hitherto, the submarine lamps employed may be ranked under two separate classes—those which are oil and those which are electric lamps. The first of these were fed with the necessary quantity of air, by means of long india-rubber tubes connected with pumps, of long india-rubber tubes connected with pumps, and required a constant expenditure of manual labour to keep them alight. Moreover, the light was very poor and dim, and the tubes were incessantly in the way of the divers engaged in the work. The electric lamp had one difficulty to contend with, and that was its high price. There was also another circumstance attending its use, which resulted from the actual brillians of the which resulted from the actual brilliancy of the light it threw out. It was the intensity of the shadows. It is well known that the more brilliant the light the deeper the shadow, and so deep have the shadows of the electric light proved that they have been acknowledged to seriously interfere with the utility of that vivid source of illumina-tion. Aware of the many inconveniences in cornection with the existing lamps, MM. Leanté and Dénoyel, two former pupils of L'Ecole Polytechnique, proposed to construct a lamp which should carry its own source of illumination, burn without any communication with the external air, and be less expensive than its predecessors. This lamp is represented in fig. 1, and we shall briefly de-



scribe it.\* We may previously remark that it has been tested with the most satisfactory results in the presence of the members of L'Académie des Sciences.

The lamp belongs essentially to what is well known as the moderator type, which were so much in vogue previously to the introduction of their simpler rivals and supplanters—the paraffin lamps. The gas which feeds the lamp is oxygen, and compressed by ten atmospheres, is enclosed in a reservoir placed below the lamp, and is conveyed by means of a small tube to a pair of annular receptacles, one of which is outside and the other inside the wick. Both of these are pierced with a number of the below. the wick. Both of these are pierced with a number of small holes. There are simple appliances for regulating the motion of the wick and the supply of the gas. A thick glass cover protects the lamp from external influences. Two principal conditions have to be fulfilled by a light of this description. It must, in the first place, carry its own supply, and, in the second, provide for the results of combustion. The former condition may be comparatively easy to fulfil, but the latter is surrounded with many and serious difficulties. Precautions must be adopted to prevent the products of combustion accumulating in the vicinity of the wick,

#### EDWARDS' LAUNCHING BOX.



and interfering with the illuminating properties of the flame. The problem to be solved was, in of the flame. The problem to be solved was, in reality, that of constructing a lamp which should consume its own smoke. After the inventors had lighted the lamp, and enclosed it in its case of crystal, it was observed to continue burning without any intermission or diminution of brilliancy, and upon searching for the products of combustion it was discovered that they took the form of a condensed liquid, which was diffused over the sides of the glass cover. In order to explain the principle of this curious phenomenon, it must be assumed that the products of combustion in their nascent state, being brought into contact with pure oxygen, constitute by combination with that gas a liquid compound resembling the oxides or carbides of hydrogen.

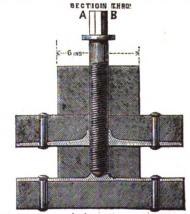
Referring to fig. 1, the lamp is represented in full elevation, and in fig. 2 is shown to a larger scale, a portion including the wick. The lamp L is placed in the interior of a strong glass cover, closed at its two ends by the two brass discs A and B, solidly joined together by the long bolts shown in the engraving. The lower disc B is attached to a guide plate C, connected to a lower one D by the iron pieces represented in fig. 1, the whole forming a sort of tripod upon which the apparatus rests when lowered to the bottom of a river or sea. Two heavy weights PP, are placed upon the tripod frame to counteract the upward tendency of the frame to counteract the upward tendency of the water. Between the upper and lower guide plates C and D is situated the reservoir R, containing the supply of compressed gas. The wick is supplied with this gas or fed by opening the cock F, which causes it to enter the tube H, and thence to pass into the smaller tubes t t; the first of these conducts the gas to the outside of the wick O (see fig. 2), and the other to the inside. To regulate the height of the wick, all that is required is to turn the milled headed screw E, which is connected by means of a vertical rod with an endless scrow, gearing into the small bevel wheel E. This latter acts directly upon the axis carrying the wick and moves it up or down, as may be requisite. In addition to these mechanical details, the reservoir R is furnished with a couple of cocks G and G. One of these serves for the filling of the reservoir, and the other is for the purpose of receiving a metallic gauge, for registering the amount of the pressure. Experiments have fully confirmed the

anticipations formed of this submarine plan of illumination. The flame is pure, brilliant, and regular, and remains constant in these particulars without any necessity for altering the height of the wick for a period of three-quarters of an hour. By increasing the pressure of the gas, and the size of the reservoir, it is expected that the duration of the constancy of the flame will be considerably prolonged.

This lamp, such as it is, or with whatever trifling modifications further experience may indicate to be advisable, appears to solve the problem of illuminating other media than that of the atmosphere in a very satisfactory manner. In the numerous instances where it is necessary to lay foundations under water, it will be found a valuable assistance to the diver, and it is well calculated, from its flame being altogether severed from all communication with the external air, to prove an effective source of illumination in mines, where the firedamp and explosions claim annually a certain number of victims.

## EDWARDS' LAUNCHING BOX.

WE recently described the hydrostatic sluice gate, designed by Mr. W. Edwards, C.E., of 52, Gracechurch-street. We now illustrate another



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<sup>\*</sup> We extract the cut and the explanation from our valuable contemporary, "Le Genie Industriel."

nious form of launching box, for lowering the centreing of bridges. This appears to be a very simple, cheap, and safe invention for this purpose; one man with a spanner in each hand being sufficient to lower the centres of a 60ft. span bridge in fifteen minutes without any risk. Its construction is rendered so clear by means of the illustration, that any further description is unnecessary. This launching box was used successfully in launching a bridge on a skew of 44ft. or 56ft. with the centre line of roadway in fifteen minutes, with one man and one coolie, and the deflection of the crown of the arch was only one-thousandth part of a foot, as nearly as could be observed by a powerful instrument. The bridge referred to was across the South Channel Sreeramdavur Dam, Talook, Mysore; and span 41ft. Gin. on the square, easily transported, weighing only 32lb. each, for a 40ft. span, and can be fixed in any position for launching. The scales mark exactly the degree to which the centre beam has been lowered. The cost of the apparatus is, we believe, very small.

#### IMPROVED LEVER WATCH CONSTRUC-TION.

THE annexed engravings represent an improved method of constructing lever watches according to the patented invention of Mr. Borthwick Smith, of Coventry. The improvements consist in the adaptation of the detached lever and other escapements to watch movements constructed upon the 3-plate principle, but in such manner as facilitate the complete separate detachment of the escapement, without displacing any other part. At the same time, it affords the same freedom for action as in full-plate watches, instead of cramping the pallets and pallet-wheel under a cock beneath the balance, as in the usual \(\frac{3}{4}\)-plate construction. In the patent movement both this cock and the escapement bar on the pillar plate are dispensed with, and the escapement is pivoted into the solid pillar plate and a bar on the top plate, by removal of which latter the pallets and pallet-wheel are detached.

The patent lever escapement, as adapted for this construction, is pitched with the pallets at right angles to the lever, and having their centre of motion in a straight line from the balance staff to the pallet-wheel hole. The roller and pallets are constructed in the usual manner, except that the diameter of the former and the size and draught of the latter are so proportioned as to compensate for the increased length of lever, and give the same action as in the ordinary detached lever escape-The lever is extended beyond the front of ment. the pallets under the pallet-wheel, in order to balance it fore and aft of the pallet staff. The arrangement of the train of wheels, the hollow centre pinion for setting the hands from the back, fusee compensation, maintaining power, stopwork, &c., is the same as in the ordinary 3-plate move-ment, but the frame is constructed in different ways to adapt it for the different fashions of watch case. For instance, construction No. 1 (shown in

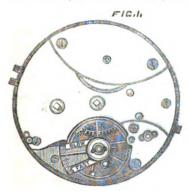


fig. 1), for consular cases, has the escapement bar fixed at the extremity of and beyond the top plate, to which at the one end it is screwed, and at the other end, beyond the escapement, it is screwed to an extra pillar, placed opposite the balance. bar is also fixed on the top plate to receive the barrel (as in full-plates), and allow of its separate detachment when necessary.

Construction No. 2 is specially adapted for being

fully capped and fitted in consular cases, and has arrangement as No. 1 for separate detachment of the barrel and escapement, but the escapement bar is screwed to the top plate only, over a hollow filed in the plate round the pallet staff and pallet-wheel holes, while the balance cock being at the aft extremity. The barrel of the

is also dispensed with, and replaced by a bar on the top plate planted alongside the escape bar. This arrangement (with the balance under the top plate and the pendulum spring working in a small hollow round the staff hole) admits of being fully capped at small additional cost. A novel mode of indexing and regulating this construction is also adopted. Construction No. 3 (shown in fig. 2),



specially adapted for dome cases, has the escape bar fixed in the same manner as No. 1, but the top plate is made rather thicker, and the bar, instead of being screwed on the top of the plate, is countersunk on the edge of it; the barrel bar is also dispensed with, and by this means the top plate is made all-flush on the top, as required for domecased work

Construction No. 4 has the top plate made the same as either No. 1 or No. 3, but into the escape bar is pivoted either the pallet-wheel only, or the fourth and pallet-wheels, while the pallet staff is pivoted into a small cock beneath the balance, and the pallets set for action in the same manner as above described, but with the shortened lever. Neither construction adds to the thickness of the watch to any extent, as compared with ordinary \(\frac{3}{4}\)-plate watches. The pendulum stud is so fixed that the removal of the balance staff does not necessitate the unpinning of the pendulum spring or alteration of the regulator. Besides the important point that (on account of the simplified construction, and consequently reduced cost of finishing lever watches upon this principle) the manufacturers—Messrs. John Ryley of 17, Hertford-place, Coventry-are enabled to supply sound and accurate timekeepers, having all the advantages of 4-plate work, at a much lower price.

The other advantages of this invention are manifold, and may be summed up as follows:— The facility afforded for separate detachment the escapement, for cleaning or repairs. The increased amount of freedom and stealier action imparted to the escapement, consequent on the increased length of the arbors. Less liability to stop or perform irregularly, from oil thickening or dust accumulating, on account of the escape-ment having more freedom. Then there is the ment having more freedom. Then there is the facility for setting the hands from the back, and also that afforded for separate detachment of the barrel to fit in a new main spring when broken, or for other purposes. There is also an increased depth of main spring, which admits of the use of a spring of smaller force and steadier action, give the same amount of impulse to the train. barrel bar is readily removed (as in full plates) to engrave the name of the vendor on it, without taking the watch to pieces. Finally, we have the facility (construction No. 2) for fully capping and covering up all the working parts of the small cost, and the reduced liability of the main spring and chain to breakage, on account of the We underweaker force of main spring required. stand that these watches are coming into extensive use in the North of England, and are found to answer remarkably well.

#### HIGH PRESSURE STEAM LAUNCH WITH SURFACE CONDENSERS.

WE illustrate at pp. and an arrangement of engines and boilers for one of her Majesty's steam launches, constructed by Messrs. J. and G. Rennie. One of the principal features in this design is, that although the steam in the boiler is raised to 80lb. on the square inch, surface condensers are used for the first time, we believe, in engines of this class. The side elevation shows

shell is 2ft. 5in. in diameter, and the length is 4ft.  $9\frac{1}{2}$ in.; the number of tubes forty, the outside diameter of each being  $1\frac{3}{4}$ in., and the length 3ft. The firegate is 2ft. wide and 2ft. 5 in. long. The products of combustion escape through a chimney 9in. in diameter. The boiler is fitted with a steam dome 13in. in diameter and the same height from the shell. The smokebox is at the stoking end of the boiler. The safety valves are the ordinary spring and lever kind, with a raised provision secured to the shell of the boiler at the aft end. The end elevation shows the gauge glass, cocks, surface and bottom blow-out valves. engines are direct acting, with double guides, which act also as stays; only one cylinder is employed to drive each screw shaft, contrary to arrangements by other firms, where two are introduced. Each cylinder, in the present case, is 6in. in diameter, and the stroke for the piston

6in. The diameter of the piston rod is 1in.

The crank shaft, 1\frac{3}{4}in. in diameter, is supported in bearings 2\frac{1}{2}in. long, secured under the base of the boiler. The forward extremity of the shaft transmits motion, by spur gearing, to the centrifugal pump, which circulates the sea water through the condenser, seen in elevation and plan. The surface condenser can be converted into the injection system by the pipe in connection with the top and bottom portions, seen in the side elevation. The condensers contain eighty-six tubes, each being 9-16in, in diameter. The steam passes from the cylinder to the top portion of the condenser above the tubes, and is drained by the feed or above the tubes, and is drained by the feed of donkey pump as may be required. The latter pump is  $1\frac{1}{4}$  in in diameter, having a stroke of 3in., the feed pumps being  $\frac{7}{3}$  in in diameter, with a stroke of 6in., receiving their motion from the crossheads, as shown in the end elevation. Both donkey and feed pumps are fitted with non-return valves attached to the boilers. The link motion for starting, stopping, and reversing the engines is simply arranged. The end elevation shows the is simply arranged. The end elevation shows the motion very clearly. A single lever only is required, and the stationary point is maintained by a rod and set screw to each motion. The arrangement of the steam pipes is so obvious from an inspection of the engravings that a description is

unnecessary.

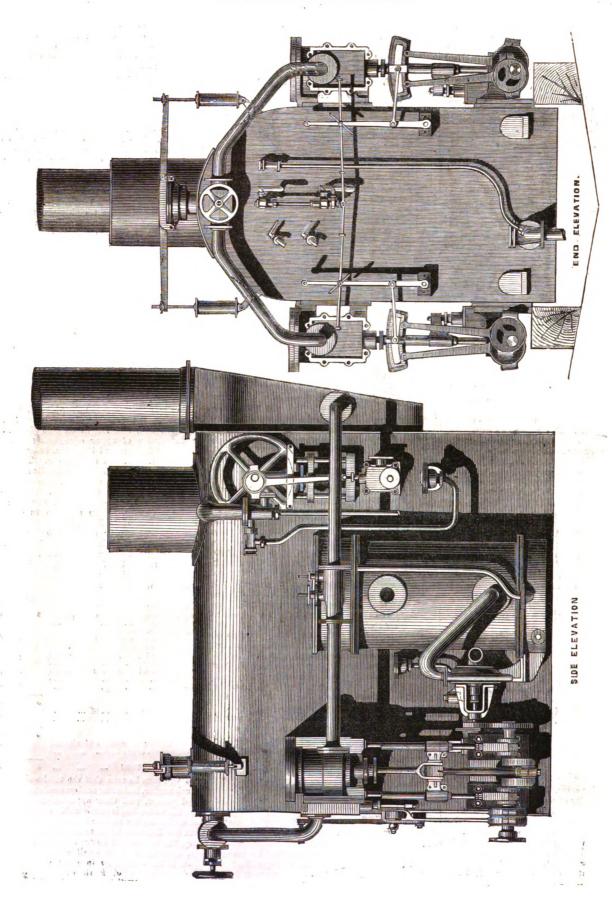
The screw propellers are four-bladed, right and left-handed, the diameter of each being 2ft. 6in., pitch 3ft. 6in., and length on line of keel  $3\frac{1}{4}$ in., the immersion of upper edge being 3in. The launch is 42ft. long and 10ft. 11in. beam; draught forward, 1ft. 11in., and aft, 3ft. ½in. The trial of these engines gave the following results :- Number of revolutions of engine mean, non-condensing, 326:333; with condenser, 328:5. Pressure of steam in boiler, non-condensing, 80:83lb.; with condenser, 73:25lb. Mean pressure in cylinders, non-condensing, 54:958lb.; with condenser 58:344lb. Indicated horse-power (nominal 5 horses) non-condensing, 30-732; with condenser, 32-84. Mean speed of launch, non-condensing, with and against tide, six runs, 7.897 knots per hour; with condenser, under similar circumstances, 8.054 knots per hour. We append the weights of material.

T T	ons.	cwt.	qrs.	lb.
Engines, boiler, centrifugal pumps, sur- face condensers, donkey engine, &c., as lifted out	2	6	0	0
Stern tube, propellers, shafts, stern brackets, propeller shafts, thrust bear- ings, bolts, and holding down plates		8	0	0
Sea cocks and pipes, discharge roses, bolts and nuts		1	3	0
Coal boxes and spanner racks and		3	0	0
spanners		2	0	0
	3	0	3	0
Water in boilers Do. in condensers		7	3	0
	3	8	3	0
Engine bearers of wood, and chocks forming part of the boat		4	2	0
Total	3	13	1	0

It will thus be seen that the total weight of the launch engine, including surface condensers, centrifigal pumps, and their appurtenances, together with the water, &c., is considerably under four tons; and excluding the surface condenser and its pipes, as in the launches hitherto adopted in the English navy, the weight will be 8cwt. less, or 3 tons 5cwt. 1qr. altogether. This small additional weight of Sewt. is the substitute in these engines for the cumbrous tanks of fresh water placed in the ordinary launch, the weight of which, with the water in them, is upwards of a ton. There is, therefore, a clear gain in the engines of this launch of about 12cwt. over those previously adopted, with a gain in speed and in space occupied in the length of the vessel.

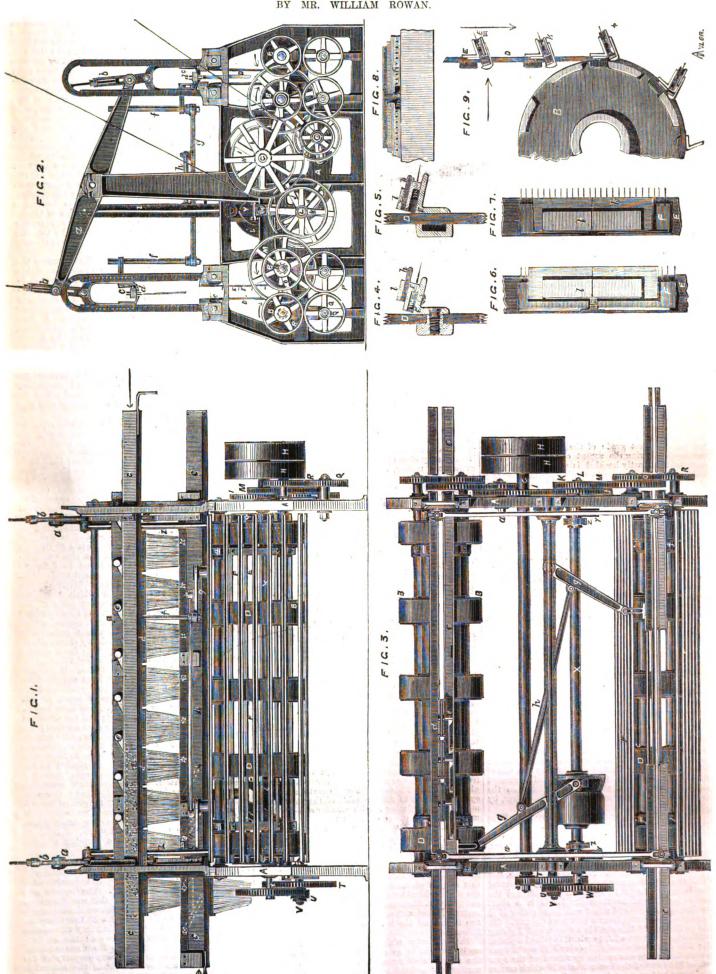
# HIGH PRESSURE STEAM LAUNCH WITH SURFACE; CONDENSERS.

BY MESSRS. J. AND G. RENNIE.



## HACKLING MACHINERY.

BY MR. WILLIAM ROWAN.



#### HACKLING MACHINERY.

MR. WILLIAM ROWAN, of the firm of John Rowan and Sons, of Belfast, has recently patented some improved machinery for hackling flax, hemp, &c., and which we illustrate on page 27. The invention possesses three features of novelty. It consists, firstly, in a new mode of fixing the hackle pins to the stocks and bars, and of attaching them to endless belts or sheets passing over drums placed one above the other, so that the hackle pins shall act upon the fibre at an angle of from 70deg, to 80deg. Secondly, in an arrangement of movable bars, termed stripping bars, which are for the purpose of freeing the hackles from the tow after they have operated oa the fibre, thus abolishing the use of brushes, card drums, and doffing combs, together with the costly arrangements necescombs, together with the costly arrangements necessary for their connection to the machine, and their mechanism of working. In the third place, it consary for their connection to the machine, and their mechanism of working. In the third place, it consists in applying guide bars to the upper and lower shafts which carry the drums, around which the belts for carrying the hackle bars are placed. The object of these guides is to cause the hackle bars and hackles to move in a parallel line, so that the tension or rigidity of the belts is not depended upon alone.

The machine itself consists of two end frames between which, on each side, a series of drums is placed one above the other, around which pass end-less belts, to which hackle bars are attached, these drums and belts being so placed that the flax during the period of hackling shall be operated upon both the period of hackling shall be operated upon both sides at once. Upon a shaft extending across the machine is placed a heart-shaped cam, which gives a reciprocating motion by means of a connecting rod to a rocking beam, which in turn imparts an ascending and descending motion to two galleries placed in guides, one on each side of the machine, and connected to the rocking beam by variating links; at the commencement of the hackling, the pitch of the hackles is somewhat far apart, but gradually becomes narrower towards the opposite end of the machine.

The action is as follows:—The stricks of flax in proper quantities are firmly fixed in holders and placed in one end of the galleries, so that the tails hang between the belts or sheets, and on the descent of the galleries are brought in contact with the

hang between the belts or sheets, and on the descent of the galleries are brought in contact with the hackles of the first or widest pitch, and the downward motion of the flax being continued through the hackles, the first grade of the hackling action is produced. During the ascent of the galleries, the material thus partly hackled is propelled with the holder a certain distance to another position between the hackles, the pitch of which, as previously ex-plained, being progressively narrower, the flax is subjected to a finer grade of hackling and so on, until it has been propelled the whole length of the row of hackles, by which time the hackling of one end is finished.

One attendant on the machine supplies holders charged with flax as space is left by the preceding holders having advanced on their journey across the machine, and on the arrival of each holder at the machine, and on the arrival of each holder at the opposite end, another attendant receives it, and after reversing the flax, end for end, in the holder, he passes it along the other side of the machine, to be subjected to a similar operation on that portion of the material proviously in the grasp of the holder, and consequently untouched in the first stage of operation. Thus, since both sides of the machine are precisely similar, when the holders have made their return journey and arrived at the end they started from the flax contained in them is comstarted from, the flax contained in them is com-pletely backled throughout the whole length of the fibre, and the first-named attendant removes it in a finished state, making use of the holders for fresh portions of flax; the progressive motion of the holders continues across the machine as long as fresh ones are supplied.

continues across the machine as long as fresh ones are supplied.

The propelling motion of the holders is accomplished by means of pawls connected to slides on the top of the galleries, which slides are moved by means of two levers and upright bars, the levers being connected together by a connecting rod, one of the levers receiving the forward and backward motion from a grooved pulley or wiper fixed on the cam shaft, and giving motion to the other lever, by means of the connecting rod just referred to.

In our engraving, fig. 1: as side elevation of the machine; fig. 2, an end view; and fig. 3, a ground plan. Figs. 4, 5, 6, 7, and 8 are different views of the hackle bars, stocks, and stripping bars, drawn on a larger scale. A A are frames of cast iron, one at each end of the machine, connected together by cross stays. B B are the lower, and C O the upper drums, around which are passed the belts or sheets D, to which are attached the hackle bars E and hackle stocks F. G is a shaft having on it at one end a fast and loose pulley H H to receive the motion from a belt from the Ill. On to receive the motion from a belt from the mill. to receive the motion from a belt from the mill. On the pulley end of this shaft is a spur wheel I giving motion to a spur wheel J, to which is joined a pinion K; this combined wheel and pinion J K works upon a stud L, and imparts motion by means of the spur wheel M to one of the lower shafts N which carries the lower belt or sheet drums B. On this same shaft is another spur wheel O gearing into a wheel P fixed on a stud below. This wheel P gears into a similar

wheel Q, also fixed on a stud, and this gearing into another wheel R above it, gives motion to the other lower drum shaft, the upper drums C receiving their motion from the lower drums B by means of the belts or sheets D. Both sides of the machine being arranged in the same manner, a description of one side is sufficient.

At the other end of the pulley shaft G is a pinion S giving motion to a spur wheel T, to which is joined a pinion U; this combined wheel and pinion T U works upon a stud V, imparting motion by means of a spur wheel W to a shaft X; upon this shaft are placed two heart-shaped cams Y, communicating a reciprocating motion by means of connecting rods Z to the rocking beam a, to which are suspended by varying links b the galleries c, in which are placed the holders d for holding the flax during the process of hackling; e are the pawls, f are the vertical bars fastened into the levers g, h is the connecting rod connecting the two levers together, f is the grooved pulley or wiper for giving the forward and backward motion, f are guide bars fitted to the upper and lower belt or sheet drum shafts, for the purpose of keeping the hackling bars and hackles in At the other end of the pulley shaft G is a pinion purpose of keeping the hackling bars and hackles in The hackle bars E are formed of angle iron, the

The hackle bars E are formed of angle iron, the angle being the same as that of the hackles, viz., from 70deg. to 80deg. The method of fixing the hackle bars to the belts or sheets is by screw pins, as shown in fig. 4. Upon the hackle bars E are fixed the hackle stocks F, and screwed thereto by screw pins, as shown also in fig. 4. The stripping bars k, figs. 4, 5, 6, 7, 8, are formed of malleable iron; their ends are riveted to brass guides l which move in and out of the recesses m formed for them in each of the hackling stocks F, the travel of these end of the hackling stocks F, the travel of these guides being such that when the stripping bar k is at its outer position it is about level with the points of the hackle pins, as shown in figs. 4 and 6, and when at its inner position projecting a little beyond the hackle stock F, as seen in figs. 5 and 7.

When the machine is at work, the stripping bar k,

before striking the flax, is at its outward position, as shown in fig. 4, but as the flax descends and meets this stripping bar, it forces the latter to its inner position, as shown in fig. 5; it then presses against the fibre when being operated upon, and keeps it in firm contact with the opposite row of pins, which is a material advantage. As soon, therefore, as it leaves the fibre, it shifts, by its centrifugal force, again to its former outward position. In doing this it completely clears the hackles of the tow and other extraneous matter, leaving them clean for the next operation.

Mr. Rowan also proposes another mode of work-Mr. Rowan also proposes another mode of working the stripping bars, the attachment of the various parts being similar to the mode already described, but instead of the centrifugal force of action being applied to the stripping bars, springs are used, which are acted upon by coming into contact with the lower belt drum B which pushes the bar to its outward position, shown at T, fig. 9: after the hackle bar has cleared itself from the drum, the spring, becoming free, brings back the stripping bar to its original inner position, preparatory to the next operaoriginal inner position, preparatory to the next opera-tion of hackling, shown at H in the same figure.

#### THE LUMINOUS SEA.\*

CURIOSITY has not been oftener excited with the phenomena of nature, nor with more pleasing sensations to those who have witnessed its full its full effects, than by the luminous appearance of the In the tropical regions where nature spreads her richest treasures, this phenomenon is seen in its greatest splendour, and the mariner, with no great stretch of the imagination, has often fancied himself in a sea of liquid fire. On the coast of Mexico, in the Pacific Ocean, during the calm of night, when stars are only visible above, the sea has assumed this appearance to such a degree that a ship actually this appearance to such a degree that a ship actually seems to be floating in a bed of sparks of active fire, and as she rises with the surface swell, or dashes it from her by any sudden effect of a wave, it curls from off her sides as a sheet of fire throwing a bread glare of light. This appearance so gratifying to the eye is sufficient to fill the mind of the person who may be contemplating it with wonder and astonishment, and the cause of it is naturally his first question. That it proceeds from animalculæ is generally known; but their nature and the circumstances under which the light is omitted is with many persons still a matter of speculation. We have, stances under which the light is omitted is with many persons still a matter of speculation. We have, therefore, considered it a subject worthy of attention, and shall lay before our readers some account of this curious phenomenon. The first we take from the philosophical transactions of the Royal Society, and the Manufacture of Limitons of the Royal Society of th entitled "Mr. Macartney's Observations on Luminous Animals," and although his paper was read long ago it has all the interest of yesterday, and is as

The property which certain animals have of The property which certain animals have of emitting light is so curious that it has attracted the attention of naturalists in all ages. It was particularly noticed by Aristotle and Pliny among the ancients, and the publications of the different

learned societies of Europe contain numerous memoirs on the subject. Notwithstanding the degree of regard bestowed on the history of luminous animals, it is still very imperfect. The power of producing light appears to have been attributed to several creatures which do not possess attributed to several creatures which do not possess it. Some species which enjoy it in an eminent degree, have been imperfectly described or entirely unobserved. The organs which afford the light in certain animals have not been examined by dissec-

certain animals have not been examined by dissection; and, lastly, the explanations which have been given of the phenomena of this light are unsatisfactory, and in some instan es palpably erroneous. As this subject forms an interesting part of the history of organized beings, I have for some years availed myself of such opportunities as have occurred for its investigation. Having communicated the result of some of my researches to the Right Honourable Sir Joseph Banks, he immediately offered me his assistance with that liberality which so eminently distinguishes him as a lover of science. offered me his assistance with that liberality which so eminently distinguishes him as a lover of science. I am indebted to him for an inspection of the valuable journal he kept during his voyage with Captain Cook; for permission to copy the original drawings in his possession of those luminous animals discovered in both the voyages of Cook and for some notes on the luminous experance. animais discovered in both the voyages of Cook and for some notes on the luminous appearance of the sea that were presented to him by Captain Homsburgh, whose accuracy of observation is already known to this learned society.

In the following paper I shall first examine the grounds on which the property of showing lights has been ascribed to certain animals, which either do not presess it or in which the existence is quaetion.

has been ascribed to certain animals, which either do not possess it or in which its existence is questionable. I shall next give an account of some luminous species of which some have been inaccurately described, and others quite unknown. I shall endeavour to explain from my own observations, and the information communicated to me by others, many of the circumstances attending the luminous appearance of the sea. I shall then describe the organs employed for the production of light in certain species; and, lastly, I shall review the opinions which have been entertained respecting the nature and origin of animal light, and relate the experiments I have made for elucidating this part experiments I have made for elucidating this part the subject.

of the subject.

The property of emitting light has been reported to belong to several fishes, more particularly the mackerel, the moon fish (Tetradon ircola), the dorado, mullet, sprat, &c. M. Bajon observed during the migration of the dorados, that their bodies were covered with luminous points. These points, however, proved on examination to be minute spherical particles that adhered to the surface of these fishes; and, he adds, appeared to be precisely the same sort of points that illuminated the whole of the sea at the time. They were, therefore, in all probability, the minute kind of medusa which I shall have occasion to describe hereafter. Godehan de Rivilla, states in a paper sent to the Academy of Sciences at Paris, that on opening the Scomber polamus he found in different parts of its body an oil which gave out much light.

to the Academy of Sciences at Paris, that on opening the Scomber polamus he found in different parts of its body an oil which gave out much light. But it should be observed that Rivilla had a particular theory to support for which this fact was very convenient, and that other parts of his memoir bear marks of inaccuracy. It may be added that if the oil of fishes were usually luminous, which Rivilla supposed, it would be almost universally known, instead of resting on a solitary observation.

As far as I am able to determine from what I have seen, the faculty of exhibiting light during life does not belong to the class of fishes. It appears probable that some fishes may have acquired the character of being luminous, from evolving light soon after death. Some species of lepas, nurex, and channa, and some star-fish, have been known to possess the power of shining; and the assertion has been repeated by one writer after another; but without quoting any authority. Bringueire saw on one occasion, as he supposed, common earthworms in a luminous state: all the hedges were filled with them; he remarked that the light resided in the posterior part of the body. Hanguerges pretended to have seen earthworms luminous in three instances; it was each time in October; the body shone at every part, but most brillantly at the gonital organs. it was each time in October; the body shone at every part, but most brillantly at the genital organs. Notwithstanding this concurrence of testimony, it is next to impossible that animals so frequently before our eyes as the common earthworm, should be endowed with so remarkable a property without every person having observed it. every person having observed it.

In different systems of natural history the In different systems of natural history the property of shining is attributed to the Cancer pulex. The authorities for this opinion are Hablitzl, Thules, and Bernard. The fermer observed on one occasion a cable, that was drawn up from the sea, exhibit light, which on closer inspection was proved to be covered with these insects. Thules and Bernard reported that they met with a number of this species of cancer on the borders of a river, entirely luminous. I am nevertheless disposed to question the luminous property of the Cancer pulex, as I have often had the animal in my possession, and never perceived it emit any my possession, and never perceived it emit any light. The account given by Linneus of the Scolopendra phosphorea is so improbable and inconsistent, that one might be led to doubt the

· From the " Nautical Magazine."

existence of this insect; particularly as it does not

existence of this insect; particularly as it does not appear to have been ever seen except by Ekaberg, the captain of an East Indiaman, from whom Linneaus learned its history.

I now proceed to the description of those luminous animals that have been discovered by Sir Joseph Banks, Captain Horsburg, and myself. On the passage from Madeira to Rio Janeiro the sea was observed by Sir Joseph Banks to be unusually luminous, flashing in many parts like lightning. He directed some of the water to be hauled up, in which he discovered two kinds of animals that occasioned the phenomenon: the one a crustaceous insect which he called the Cancer fulgens, the other a large species of medusa to which he gave the name of pellucens.

The Cancer fulgens bears some resemblance to

The Cancer fulgens bears some resemblance to the common shrimp. It is, however, considerably less:
the legs are furnished with numerous seta (hair or bristles). The light of this animal, which is very brilliant, appears to issue from every part of its

body. The Medusa pellucens measures inches across the crown or umbella (round head



containing the seed). This part is marked by a a number of opaque lines that pass off from the centre to the circumference. The edges of the umbella is divided into lobulas which succeed each other; one large and two small ones alternately. From within the margin of the umbella, there are suspended a number of long cord-shaped tentacula. The central part of the animal is opaque, and furnished with four thick irregularly shaped processes, which hang down in the midst of the tentacula. This zoophyte is the most splendid of the luminous inhabitants of the ocean. The flashes of light emitted during its contractions are so vivid as to affect the sight of the spectator.

In the notes communicated to Sir Joseph Banks by Captain Horsburg, he remarks that the luminous

by Captain Horsburg, he remarks that the luminous state of the sea between the tropics is generally accompanied with the appearance of a great number of marine animals of various kinds on the surface of the water, to many of which, however, he does not the water, to many of which, however, he does not attribute the property of shining. At other times when the water which gave out light was examined it appeared to contain only small particles of a dusky straw colour, which dissolved with the slightest touch of the finger, He likewise observes that in Bombay during the hot weather of May and June he has frequently seen the edges of the sea illuminated by minute specifier points. illuminated by minute sparkling points.

At sunrise on the 12th of April, 1798, he perceived

several luminous spots in the water, of which spots,



conceiving them to be animals, he went in a boat and caught one. It proved to be an insect some-what resembling in appearance the wood-louse, and was about one-third of an inch in length. When was about one-third of an inch in length. When viewed with a microscope it seemed to be formed by sections, of a thin crustaceous substance. During the time that any fluid remained in the animal, it shone brilliantly like the firefly. In the month of June of the same year, he picked up another luminous insect on a sandy beach that was also covered with a thin shell, but it was of a different shape, and of a larger size than the animal taken in the Arabian Sea. Comparing the above description with a neat pen and ink sketch made by Captain Horsburg, and which accompanied his paper, I have no doubt that both these insects were monoculi. The first evidently belongs to the genus Limulus of

I shall therefore beg leave to distinguish

Muller. I shall therefore beg leave to distinguish it by the name of Linulus Nocticulus.

My pursuits and the state of my health having frequently led me to the coast, I have had many opportunities of making observations on the animals which illuminate our own seas. Of these I have discovered three species, one of which is a veroe, not hitherto described by authors, enother serves.

authors: another agrees so nearly with the Medusa hemispherica, that I conceive it to be the same, or at least a variety ofthat species. The third is a minute species of Medusa, which I believe to be the luminous animal so frequently seen by navigators; although it has never heen distinctly examined or described. It is drawn

been distinctly examined or described. It is drawn here magnified to about twelve times its natural size. I first met with these animals in the month of October, I first met with these animals in the month of October, 1804, at Herne Bay, a small watering place on the north coast of Kent. Having observed the sea to be extremely luminous for several nights, I had a considerable quantity of the water taken up. When perfectly at rest no light was emitted, but on the slightest agitation of the vessel in which the water was contained, a brilliant scintillation was perceived, particularly towards the surface. When the vessel was suddenly struck a flesh of light issued from the vas suddenly struck, a flash of light issued from the top of the water, in consequence of so many points shining at the same moment. And when any of these sparkling points were removed from the water, they no longer yielded any light. They were so transparent that in the air they appeared like globules of water, They were so minute as to be even less than the head of the smallest pin. On the slightest touch they broke and vanished from the

sights. Having strained a quantity of the luminous water, a great number of these transparent corpuscules were obtained upon cloth, and the water which had been strained did not afterwards exhibit the least light. I then put some sea-water that had been rendered particularly clear by repeated of the strain into a large glass vessel, and having filtration, into a large glass vessel, and having floated in it a fine cloth on which I had previously collected a number of luminous points, several of collected a number of luminous points, several of them were liberated, and became distinctly visible in their natural element, by placing the glass before a piece of dark coloured paper. They were observed to have a tendency to come to the surface of the water, and after the glass had been set aside for some time, they were found congregated together, and when thus collected in a body they had a dusky straw colour; although individually they were so transparent, as to be perfectly invisible, except under particular circumstances. Their substance, indeed, was so extremely tender and delicate, that they did transparent, as to be percently in the particular circumstances. Their substance, indeed, was so extremely tender and delicate, that they did not become opaque in distilled vinegar or alcohol until immersed in these liquors for a considerable

On examining these minute globules with the microscope, they proved to be not quite perfect spheres. They had an irregular depression on one side that was formed of an opaque substance that receded rather inwards, producing such an appearance of the substance of a round receded rather inwards, producing such an appear-ance as would arise from tying the neck of a round bag, and turning it into the body. The motions of these creatures in the water were slow and graceful, and not accompanied by any visible contractions of their bodies. After death they always subsided to the bottom of the vessel. From the sparkling light afforded by this species, I shall distinguish it by the name of Meduas scintillans. On the night after that in which I discovered the

by the name of Medusa scintillans.

On the night after that in which I discovered the preceding animal, I caught two others of the luminous species. One of these I call the Beroe fulgens. This most elegant creature is of a colour changing between purple, violet, and pale blue. The form of it is difficult to assign as it is varied by partial contraction at the animal's pleasure. I have represented here the two extremes of form which I have seen this creature assume. The first partial contraction at the animals pleasure. In have represented here the two extremes of form which I have seen this creature assume. The first is somewhat that of a cucumber, which being that which it takes when at rest should perhaps be considered as its proper shape. The other is that of a pear. The body is hollow, or forms internally an infundibealar cavity, having a wide opening before, and it appears also to have a small aperture posteriorly. The posterior part, and indeed two-thirds of the body, are ornamented with eight longitudinal ciliated ribs, the process of which are kept in such rapid rotatory motion while the animal is swimming, that they appear like the continual passing of a fluid along the ribs. The ciliated ribs have been described by Professor Mitchell

ciliated ribs have been de-scribed by Professor Mitchell as arteries in a luminous Beroe, which I suspect is no other than the species of which I am giving this

account.

When the Beroe fulgens swarm gently near when the Beroe ruigens swarm gently hear the surface of the water, its whole body became occasionally illuminated in a slight degree. Dur-ing its contractions a stronger light issued from the ribs, and when a sudden shock was communicated to the water which contained several of these animals, a vivid flash was thrown out. If the body were broken, the fragments continued luminous for some seconds, and being rubbed on the hand left a light like that of phosphorus. This, however, as well s every other mode of emitting light, ceased after he death of the animal.

The hemis herical species that I discovered had a very faint purple colour. The largest that I found measured about three-quarters of an inch in diameter. The margin of the umbella was un-

three-quarters of an inch in diameter. The margin of the umbella was undivided and surrounded internally by a row of pale brown spots, and numerous small twisted tentacula Four opaque lines crossed in an arched manner from the circumference towards the centre of the animal. An opaque irregularly shaped process hung down from the middle of the umbella. When this part was examined with a lens of high power, I discovered that it was enclosed in a sheath in which it moved. that it was enclosed in a sheath in which it moved. The extremity of the process was found to be divided into four tentaculas, covered with little cusps or suckers, like those on the tentacula of the cuttle

suckers, like those on the tentacula of the cuttle fish.

This species of Medusa bears a striking resemblance to the figures Medusa hemispherica published by Grouoviers and Muller. Indeed, it differs as little from these figures as they do from each other. Its luminous property, however, was not observed by these naturalists, and this is the more extraordinary as Muller examined it at night, and says that it is so transparent it can only be seen by the light of a lump. If it should still be considered as a distinct species, or as a variety of the hemispherica, I would propose to call it the Medusa lucida. In this species the central spot and the part round the margin are commonly seen to shine on lifting the animal out of the water into the air, when it presents the appearance of an illuminated wheel. And when it is exposed to the usual percussion of the water, the transparent parts are alone luminous.

(To be continued.)

#### NEW YORK SOCIETY OF PRACTICAL ENGINEERING.

T the regular semi-monthly meeting of this A T the regular semi-monthly meeting of this Society, at the Cooper Institute, on the 24th of November, 1868, James A. Whitney presiding, the subject of Elevating Machinery was taken up, and a paper on this topic was read by Mr. T.P. Pemberton, in which he gave an extended history of ancient and modern devices used for raising heavy bodies, such as massive hewn stones in the walls of ancient edifices, and showed how the great bronze statue of St. Petersburgh and its solid pedestal, weighing about 1,000 tons, were moved to their present locality. The writer spoke of the windlass in its present rude form, as used over wells and mining pits, and stated that it was even yet used on Chinese junks, and was in vogue on English vessels not over 100 years ago; and showed how the present capstan had by successive steps of improvement superseded that device, and graphically described the similarity of the song of the sailors in all ages while heaving upon the anchor chains with whatever machinery they employed. He then proceeded more specifically to point out the most conspicuous and approved hoisting apparatus used in modern times, and gave a detailed account of the immense cranes employed in foundries, where great masses of molten metal had to be conveyed to the moulds, and in locomotive works where, in England, they lift an entire engine weighing twenty tons, over a dozen others, and move it from one end of the building to the other. He then called attention to the different elevating devices used in hotels for conveying persons and baggage from one floor to another, and spoke of the necessity of absolute safety wherever human life was jeopardized. He pointed out numerous accidents in hotels and deep mining shafts from the breaking of ropes or the giving way of some portions of the machinery, and urged the necessity of employing stops or safety pawls in all rope elevators, that would not fail to come into play whenever the rope or machinery failed to act. He showed the different kinds of lifting force employed, and condemned the use of ropes, either wire or hempen, as unsafe, and thought the screw only could insure absolute safety. He closed his paper by eloquently describing the onward strides of mechanical progress in subjecting matter to mind and the superiority of science over brute force.

The reading of the paper gave rise to a very interesting discussion on collateral subjects, in which a number of gentlemen took part. Dr. A. W. Hall referred to the well-known historical fact of immense stones, weighing not less than 800 tons, being raised and placed in the walls of ancient aqueducts 50ft. above the ground by machinery unknown to the present generation, and which would be impossible by any hoisting device now

He described on the blackboard how he in use. supposed such results were accomplished. By placing two fulcra supports under the stone, near and on either side of the centre, it could be alternately tilted at either end, while the released fulcrum was raised and underbuilt with masonry, and in this way two men might lift such a stone to any reasonable height, only give them time enough.

The solution of the problem was received with ap-

plause by the audience.

Prof. Holmes explained an English hoisting machine in use in some of the deepest coal mines, which consisted of two series of platforms about 15ft. above each other, secured to timbers extending from top to bottom of the shaft. These timbers were attached to the two ends of a beam engine at the top of the shaft, the movement of which would alternately raise one set of platforms and lower the other. All that a gang of men had to do was to step from one platform to the other, as the walking beam brought them into juxtaposition, and in this way 500 men at a time could ascend or descend a shaft without danger, as it was not possible to fall further than 15ft. if a platform gave way.

Mr. Manner gave an exhibition of his patent Arion pianoforte, and explained its peculiarities.

These relate to the manner of stringing the instrument, and supporting the strain upon the case by a newly arranged iron frame, with an extra bar between the under and over strings. It produced a remarkable volume and brilliancy of tone.

The Society then adjourned for two weeks, after the chair had announced the subject of "Mining Machinery" as the next paper in order.

#### PRINTING TEXTILE FABRICS.

PRINTING TEXTILE FABRICS.

A N invention recently patented by Mr. John Lightfoot, of Lower House, near Burnley, consists in applying to textile fabries or yarns, particularly those made from cotton or linen, certain indigo preparations simultaneously with the usual mordants for dyeing. The indigo preparations undergo the usual operations of dyeing and clearing along with the mordants, the result being that blues, greens, and other shades are produced along with the colours obtained by dyeing mordants with dye stuffs. The use of indigotine, combined or mixed with an oxide or salt of tin, for producing blue figures upon cotton or linen fabrics, and subsequently raising these colours in an alkaline bath, is well known to calico printers under the name of fast blue; or when mixed with a salt of lead under the name of fast presen. When applied in madder or garancine styles these colours have been usually blocked into spaces left vacant for them after the pieces have been printed, dyed, cleared, and dried. From time to time attempts have been made to print simultaneously with the madder and garancine mordants, preparations of indigo, and, in some cases, those named above as fast blue and fast green, so as to save the expense of blocking in these colours after dyeing. But either from the blues and greens so produced having been dull and wanting in vivacity, or from the mordants having been attacked by the alkaline bath used to fix the indigo colours, and the dyed colours thus coming from the bath poor and bare, or from special apparatus having been necessary to print the indigo colours, these attempts have never met with success. The discovery, therefore, of an efficient process which will enable the simultaneous printing of blue and green with mordants intended for dyeing to be successfully carried into practice was and remained a desideratum up to the present time. Mr. Lightfoot has succeeded in discovering that the difficulties which have prevented success hithertomay be obviated by using the indigo preparations.

for dyeing to be successfully carried into practice was and remained a desideratum up to the present time. Mr. Lightfoot has succeeded in discovering that the difficulties which have prevented success hitherto may be obviated by using the indigo preparations, and by employing for fixing indigo blue and green in juxtaposition with ordinary madder mordants materials presently mentioned, these materials not having been so used before.

This process enables the operator to produce fine blues and greens, which are printed at the same time as the ordinary mordants for reds, purples, chocolates, and black, and undergo with them the operations required to dye and clear these colours. Mr. Lightfoot makes a preparation of indigo, fulfilling the required conditions by employing much less tin, whether as oxide or in the state of salt, in the process of dissolving the indigo than has hitherto been used, and also by dispensing with the addition of a salt of tin to the precipitated indigotine, whether this has been made by the aid of oxide or salt of tin, or, as is sometimes the case, by the aid of metallic tin, because he has ascertained that if the tin is in excess of a certain proportion to the indigo, oxide of tin is left in the fibre during the process of fixing the indigo colours and the mordants, and thus acting itself as a mordant, becomes dyed by the dye stuff, producing with the indigo compound colours. oxide of tin is left in the fibre during the process of fixing the indigo colours and the mordants, and thus acting itself as a mordant, becomes dyed by the dye stuff, producing with the indigo compound colours, which in the case of blue are more or less purple and dull, and in the case of green are more or less a sombre olive. This use of tin in excess has been "Martyrs of Garinchum."

one of the causes of the failures to which we have

one of the causes of the failures to which we have before alluded.

Mr. Lightfoot prepares a paste or pulp of indigotine and tin suitable for his improved process by the following method:—He takes of dry indigo in a ground or powdered state, 14lb., or when indigo pulp is used, using such a quantity as to be equal to 14lb. of dry indigo, of protochloride of tin in crystals 14lb., and of caustic soda at 30deg. on Twaddell's hydrometer, or of caustic potash at 40deg. on Twaddell's hydrometer, I gallon. These materials are put in a pan and raised to boil in half an hour, and 1 gallon of boiling water is then added. The mixture is now allowed to become perfectly cold, and 3 gallons of cold water, in which are dissolved 8oz. of sugar, or 1lb. of treacle is poured into it. To this solution is added 2½ pints of muriatic acid at 32deg. of Twaddell's hydrometer, or 1 pint of sulphuric acid of commerce, previously diluted with 1 pint of water, and allowed to stand till clear, or 3 quarts of acetic acid at 8deg. of Twaddell's hydrometer.

The indigotine may also be precipitated by a mixture of protochloride of tin solution at 120deg. of Twaddell's hydrometer, with any of the acids named, using one quarter of a pint of tin solution, and only half the quantities of the acids given above, this quantity of tin solution being the maximum that can be used when precipitating the indigotine for producing a fine blue and green. Instead of using protochloride of tin crystals in making the indigo solution, protoxide of tin made by precipitating a solution of protoxalt of tin with an alkali may be used, the precipitate being washed with water and filtered to a thick paste, or anhydrous protoxide of tin made in any convenient way may be employed, in all cases taking such a proportion of oxide as shall contain an amount of tin about equal to but not greater than that in 14lb. of crystallized protochloride. In some cases the mixture of 14lb. of indigo and 1 gallon of alkali may be boiled with metallic tin in powder or granulated, the qua there shall be metallic tin undissolved. In all these cases the indigotine is precipitated as previously described, and the precipitate is filtered through a deep conical filter so as to leave as small a surface exposed to the air as possible.

to the air as possible.

To make a blue colour for printing, take 4 gallons of indigotine precipitate and 14lb. of gum senegal in powder, stirring until dissolved; after straining, the colour is ready for printing. To make a green colour, take 41 gallons of indigotine pulp and 18lb. of gum senegal in powder, stir till dissolved, and add 11lb. of nitrate of lead in powder, and 11lb. of white acetate of lead in powder, stir till dissolved and strain.

Compound colours may be made by mixing the Compound colours may be made by mixing the blue and green colours with each other or with the ordinary mordants for dyeing. With the blue and green above described, and the ordinary ferruginous and aluminous mordants, Mr. Lightfoot prints cotton and linen fabrics, and after cooling, hangs the pieces in an ageing room for one night; they then undergo the fixing operation by passing them into a solution of silicate of soda or silicate of potash at 8d g. of Twaddell's hydrometer, or into a solution of carbonate of potash at 12deg. of Twaddell's hydrometer, to which about 1oz. of chalk in powder per gallon may be added, or into a mixture of silicate of soda or silicate of potash at 8deg. of Twaddell's hydrometer with carbonate of potash at 12deg. of Twaddell's hydrometer. The bath is heated to 90deg. Fah. or thereabouts in a cistern fitted with rollers at the top and bottom, and the passage of the 90deg. Fah. or thereabouts in a cistern inted with rollers at the top and bottom, and the passage of the pieces may be at the rate of 25 yards per minute. On leaving this the pieces must be quickly winced in a pit of cold water fitted with a reel about 4ft, above the surface of the water. By this wincing the indigotine attached to the fibre becomes again indigotine.

Indigotine attached to the libre becomes again indigo blue.

If green has been printed, the pieces are next passed into a solution of bichromate of potash containing loz. of bichromate of potash per gallon of water at 100deg. Fah. for five minutes; the goods are then washed. If only blue has been printed along with the mordants this process may be omitted. The pieces are next subjected to the operation known to calico printers as "second dunging," and which consists in making the pieces circulate in a beck containing cowdung and water at a temperature of about 160deg. Fahr. for from fifteen to twenty minutes. They are then washed with water and dyed with madder, munjeet, flower of madder, garancine, extract of madder, cochineal, mixtures of garancine with sumac and bark, or with either of them, after which the ordinary operations of clearing the white grounds may be performed, preference being given to the chloride of line clearing unallys adopted with garancine colours.

## Correspondence.

THE OSCILLATORY MOVEMENT OF THE EARTH.

TO THE EDITOR OF THE "MECHANICS MAGAZINE."

Sir,—In the many theories that have been brought forward, I cannot find one that sufficiently explains what may be called "the oscillatory movement of the earth." It may be premature to further advance the theory that a planet increases in gravity, and consequently in orbit, at the expense of the central bedy until by couler demonstration, these doubtes consequently in orbit, at the expense of the central body, until, by ocular demonstration, those doubts which still cloud the mind of the scientific world shall be removed. But as all doubts have long since vanished from the mind of the writer, allow him to offer a remark upon the subject in advance of the telescope. The oscillatory movement of the earth results from the alternate accumulation of the solar deposits upon each side of the equator—which is the elucidation of the phenomena of the seasons. The question arises,—whether, from the preponderance of land north of the equator and on the side where the ocean is the principal recipient, there is not an inequality in the gravitating medium? Such being the case, we must admit a gradual change in the line of the equator. This, combined with the gradual subsidence of internal heat, may account not only for the position of fossil remains, but assist in the elucidation of questions that have long baffled philosophical research. The exact accordance in the sophical research. The exact accordance in the oscillatory movement of the earth with its orbit ought to be a question of great importance. The error of modern science appears to consist in the misconception of an original cause.—I am, Sir, yours, &c.,

H. Saloway. yours, &c.,

H. Salov

13, Standard-street, Dover-road, January 4.

#### THE SOLID LEVER BRIDGE.

SIR,—In your number of June 26 last, you drew the attention of your readers to what, in America, appears to be a new method of constructing a bridge. I beg to enclose a photograph which represents the



I the Limits bridge in common as in the franciacan in mutains, and in Cashmere. It appears to me to be identical with the bridge that you describe, as far as solid levers are concerned. In a country where iron is extremely valuable and difficult to procure, the utility of these bridges is very great. The abutments are composed of alternate layers of rough stone and the bridge is constructed without the timber, and the bridge is constructed without the use of an ounce of metal.—I am, Sir, yours, &c.,
Madras, November 23. H. C. W.

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in

of £1 is. 8d, yearly, or 10s. 10d. half-yearly payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, Ep. M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise-Special arrangements made for large advertise-

RECRIVED.—W. R.—L. B. and Co.—T. C.—R. B.—R. and W.—T. B.—H. L.—C. D.—W. H. T.—S. K. M.—J. C.—R. M.—R. A.—J. T. B.—T. C. H.—J. N.—W. H. R.—R. T.—J. B.—D. and Co.—W. F.—C. E.—G. W.—A. S.—G. B.—R. T.—B. H. J.—W. J.—T. R.—F. R. S.—G. W.—R. S.—F. B. C.—B. A.—F. and Co.—W. T.—B. and H.—F. G.—T. N.

## Aleetinas for the Taeek.

TUES .- Royal Institution .- Mr. R. Westmacott, on "Fine

TUES.—Royal Institution.—Mr. R. Westmacott, on "Fine Art," at 3 p. m.

The Institution of Civil Engineers.—Discussion upon Mr. S. P. Bidder, jun.'s, Paper on "Mechanical Appliances for Getting Coal," at 8 p.m.

WED.—Civil and Mechanical Engineers' Society.—Mr. J. B. Walton on "The Greenock Docks and Harbour Competition," at 8 p.m.

THUES.—Royal Institution.—Mr. Rupert Jones on "Protozoa," at 3 p.m.

FRI.—Rcyal Institution.—Professor Tyndall on "Chemical Rays and Molecules," at 8 p.m.

Royal United Service Institution.—Captain J. R. C. Colomb, Royal Marine Artillery, on "The Distribution of our War Forces," Part I., at 3 p.m.

SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

## Habal, Military, and Gunnery Items.

GEORGE SIMON HARCOURT, Esq. (nee Ainslie), of the 69th Foot, and afterwards with the 1st or Royal

the 69th Foot, and afterwards with the 1st or Royal Dragoous, one of the few remaining officers who served at the battle of Waterloo, died, on December 29, at Bedford, at the age of 72.

CAPTAIN TALBOT, of the "Star of Hope," has been presented with a gold chronometer watch, by Captain Munro, Mr. Brown, and the others who were rescued from the wreck of the "Hibernia." A movement has been set on foot in Edinburgh and Leith to present Captain Talbot with a public testimonial. mouial.

monial.

The Lords of the Admiralty have directed that a report shall be prepared of what is likely to be the expense of converting the wooden line-of-battle ship "Cumbriland," late guardship of the steam reserve at Sheerness and Chatham, into a training-ship for boys, If it should be determined to carry out the idea, the "Cumberland" will be stationed in the Cludo.

THE attention of the Secretary of War having been directed to the large expenditure incurred by the military and civil departments of the army in telegraphic messages, an order from the War De-partment has been issued directing that the utmost caution be observed in the recourse to this mode of communication, which should be adopted only in cases where the delay involved in a letter by post would really prove prejudicial to the public service.

Sir P. Francis has recommended Alex. Nair, one

of the crew of the barque "Tyne," lost off the Island of Marmora, to the Foreign Office for some suitable reward for his courage on the occasion. The vessel was wrecked about half a mile from the shore of the island, and the brave fellow swam ashore with a light line, which enabled him to land a cable, along which the captain and the remainder of the crew effected their escape.

The Board of Trade have determined to present

a binocular glass to Captain Rumball, master of the American brig "Dirigo," in acknowledgment of the American brig "Dirigo, in acknowledgment of the humanity shown by him in rescuing the mate and five scatnen of the "John Duncan," of St. John's, N.B., wrecked in a hurricane in November last. The only survivors on board the "John Duncan" (the rest having been washed overboard), were nine the rest having been in a most distressed condition for twelve days, when they were taken off the wreck by the American ships "Rabbon" and "Drigo." IT appears that the port of Trouville, opposite Havre, across the mouth of the Seine, is being

Havre, across the mouth of the Seine, is being adapted to receive the largest ships, and that from a mere fashionable bathing place it is to become a chief point in transitu between England the southwest of France. It is ninety-five miles less from Trouville to Bordeaux, via Mans than from Havre to Bordeaux. Arrangements have already been made at Trouville for receiving large supplies of English coal, destined for Normandy, and the departments to the south of it. to the south of it.

the meeting of the Chatham Local Board of Health last Friday they had under consideration the necessity which exists, both in connection with the military and naval establishments as well as for the military and navai establishments as we as for ine public in general, for an electric time gun to be fired daily, as is the case at many of the other large military and naval stations, in order that correct Greenwich time may be notified. The Board unanimously decided to apply to the Government on the subject, and a deputation was appointed to wait on the authorities to request that the necessary arrangements might be made.

A FIRE broke out in Fort Lafayette, New York Harbour, on December I last, which resulted in the destruction of all the combustible part of the structure. It appears that a party of labourers in the employ of the engineer department, were engaged in putting a shed over the casemates, and that at dinner time one of them built a fire in a regular fireplace for the purpose of warming his coffee. Sparks from this fire fell on the roof, which conce. Sparks from this fire fell on the roof, which was soon in a blaze, the flames spreading to the large quantity of lumber then in the Fort to be used in making a roof. Owing to a want of suitable appliances for extinguishing such a fire, the flames only ceased their work when they had nothing more to feed upon.

MR. MARTELL, the newly-appointed chief surveyor MR. MARTELL, the newly-appointed chief surveyor of Lloyd's on the Tyne, has just completed his returns of shipbuilding on the Tyne for the past year. From the statistics we find the tonnage launched has exceeded by more than 50 per cent. the figure of the previous year, 1867. This is accounted for by the fact that considerable impetus has of recent years been given to the eastern trade, and there has been a demand for new years), of and there has been a demand for new vessels of larger tonnage and higher class. There has also been an increase for first-class steamers with capitalists, while there has been a gradual declension in sailing vessels. According to the returns just published, fifty-eight vessels have been built, with a grass tonnage of 25 604 tons average tonnage. a gross tonnage of 25,694 tons; average tonnage, 525. Last year the number of vessels built was thirty-four; gross tonnage, 16,224; average tonnage, 477. It will thus be seen that in 1868 ship-building on the Tyne was decidedly better than in the preceding year.

## Miscellanea.

A GOOD specimen of the spoonbill was shot on the 21st ult., at Benacre, in Suffolk. These birds are rare visitors to this country.

A FRENCHMAN has observed that when the hori-

zontal branches of a vine are attacked with oidium, those that are vertical are in most cases free from it.

NEARLY half-a-dozen towns in Cornwall that do not enjoy railway communication, will, in the course of a week or two, participate in the advantage of the electric telegraph.

A RARE Hebrew Bible, of the Naples edition of

A RAKE Hencew Bible, of the Naples edition of 1491 or 1492, printed upon vellum, was recently sold at Puttick and Simpson's, Leicester-square, after a smart competition, for £160.

MARSHAL VAILLANT, Minister of the Emperor's Household, and of the Fine Arts, has given a site on the territory of the Depot of Marbles, for the erection of the model of the railway bridge from Calais. tion of the model of the railway bridge from Calais

A YEAR since, the number of Chambers of Agriculture established in Great Britain was 36, now it has increased to 70. At the close of 1867 the aggregate number of members enrolled was 10,000, now it has increased to 16,000.

THE Chamber of Commerce and Arts of the pro-

THE Chamber of Commerce and Arts of the province of Coni has addressed a letter to the Emperor Napoleon, soliciting his Majesty's support for a tunnel through the Col di Tenda, so as to bring France and Italy nearer in that quarter.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending January 2, was 12,742. Total number since the opening of the Museum free daily (May 12, 1858), 1.469.309 1.469.309.

A serious landslip has occurred at Dartmouth. Several tons of earth and rock have fallen at the Castle, filling up the cove and destroying the footpath

Castle, filling up the cove and destroying the footpath leading to that romantic place. It is feared that a further slip will take place.

At a recent meeting of an engineering society in New York, Dr. J. V. C. Smith, of Boston, described an antique water-wheel, which he had seen at work sin one of the gorges of the Lebanon mountains, and of which the Arabs said that the same kind had been in nearly that country for a gos.

in use in that country for ages.

Mr. Fell. C.E., has offered to the Swiss Federal MR. FEIL. C.E.. has offered to the Swiss Federal Council to undertake the construction of three rail-roads over the Alps for a guarantee of interest of 600,000f, annually. He estimates the cost of that over the Simplon at from 11 to 13 millions; of the St. Gothard at from 13 to 14; and at 15 to 18 for the Luckmanier.

THE galleries of Greek and Roman sculpture in the Louvre have been largely increased and embellished of late, and amongst the ornaments introbetitshed of late, and amongst the ornaments intro-duced are a number of bas-reliefs, round bosses, and allegorical figures, covered with a coating of metal, the work of M. Cossinus. The effect of these electrotype bronzes is extremely rich, while the cost

is trivial compared with real bronzes.

Some months ago, Mr. Robert Metcalfe, of Malton, was commissioned by one of the largest landowners in Prussia to send out two Leicester rams for the first season. These sheep did so well that Mr. Metfirst season. irst season. These sheep du so wen that Mr. Mel-calfe has received a similar order. He has again selected two rams from the well-known Barton flock. The sheep are this time the descendants of the famous Sir Tatton, which won thirty-six first pre-

THE number of visitors to the South Kensington The number of visitors to the South Kensington Museum ending January 2, 1869 (Christmas week), open free from 10 a.m. to 10 p.m., daily 34,045; Meyrick and other galleries 8,122; total—42,167. Average of corresponding week in former years, 24,417. The total number of visitors during the year ending December 31, 1868, has been—morning, 599,143; evening, 281,033, making a total of \$81,076, or 234,560 over the preceding year. Total from opening of Museum—8,013,164.

The week before last, a number of salmon were caucht in a small tributary of the Usk for the

caught in a small tributary of the Usk for the purpose of obtaining spawn for New Zealand. The successfully conducted by operations were very successfully conducted by Neville, from Mr. Buckland's museum in the Horticultural Gardens, and in a few hours about \$5,000 salmon ova were secured. Mr. Berrington,

the chairman, Mr. Lloyd, and the superintendent of water builiffs were present. The ova have been since carefully packed by Mr. Youl in eighty-one boxes, on board the ship "Mendora," in the London

WE understand that arrangements have been made between a number of gentlemen interested in the subject whereby Mr. Fairlie's four cylinder, double bogie locomotive will shortly be introduced, in its most improved form, in regular work upon one or more English lines. A number of these engines are most improved form, in regular work upon one or more English lines. A number of these engines are now in course of construction in the States for various lines there; among others, for the Central Pacific Railway of California which rises 7,042ft, in a distance of 105 miles, with long gradients of a maximum inclination of 1 in 45<sub>1</sub>.

Mr. James Allison Hogg, gas engineer, Edinburgh, has discovered a method of producing intense light with coal gas by mixing it with atmospheric air. The mixture of gases is lighted after passing through a tissue of iridio-platina wire at a determined pressure. In a few seconds the metal becomes heated up to a white heat, the flame

metal becomes heated up to a white heat, the flame metal becomes heated up to a white heat, the flame disappears, and an intense white light is the result. An enlarged picture has been taken by its aid on prepared photographic paper. The light will burn in a gale of wind without any protection round it, and a downpour of rain will not affect it.

MR. Benson has just fitted up in the front of his premises in Ludgate-hill three most useful indicators —viz. a clock perpetual calendar, and wind dial.

viz., a clock, perpetual calendar, and wind dial. The clock occupies one window, the perpetual calendar another. This consists of three dials, and is a most ingenious piece of mechanism, showing at The clock occupies one window, a glance the month, the day of the month, and day of week, and is so constructed that the long and short months, and even the extra day in February of Leap Year are correctly indicated. Mr. Benson has placed in a third window a wind dial, fitted with a pointer, which indicates on the compass the direction of the wind. The three dials are illuminated

RECENTLY, in removing a sand bank contiguous to the Ouse, a few miles north of York, a deposit of stone and flint axes, knives, flakes, &c., was found at about 10ft. deep in undisturbed sand, and beneath several unbroken layers of leamy clay. A party o archeologists, among whom were Canon Greenwell, of Durham, the Rev. J. Robertson of Appleton, and Mr. George Slater, of Malton, have visited the place Mr. George Slater, of Malton, have visited the place and made a thorough examination. From the survey and from the evidence collected the implements seem to have come from beneath several feet of apparently undisturbed gravel sand, but were generally thought not to be of the same age as the sandbeds. The thing is a puzzle for geologists and archæologists both.

The bronze doors designed, one for the entrance to the University States House of Representatives, and

to the United States House of Representatives, and the other for one of the doorways of the Senate hamber at Washington, and which had their inception some fifteen years ago, are now in their places, and receiving the finishing touches. Each door weighs entire 8,000lb., and its casing 6,000lb. more, so that the total weight of the bronz, work in each door is 14,000lb. The designs upon the panels illustrate the history of the discovery of America by Columbus, and sprang from the genius of Crawford and Rogers, the former of whom died before his portion of the work was quite completed. The sum total of the cost to the American Government will be about 50.000 dollars.

THE Metropolitan Board of Works has ordered THE Metropolitan Board of Works has ordered that the line of thoroughfare extending westward from Cavendish-square to the intersection of Dukestreet, and now known as Wigmore-street and Edwards-street, be named Wigmore-street throughout. That the subnames in Clapham-road and Clapham-rise be abolished, and that the whole line of thoroughfare from Kennington Park-road to Highstreet, Clapham, be called Clapham-road. The Board has also issued a general order directing that in every case where plans of new streets are approved, every case where plans of new streets are approved, a condition be attached that the name of each street, as approved by the Board, be affixed on posts at both ends of such proposed new street, until the houses are built, when the name shall be affixed according

THE MANUPACTURE OF WATCHES AND CLOCKS. THE MANUFACTURE OF WATCHES AND CLOCKS.

A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 38 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices and no one should make a proclass. tion of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends this namphlet to any address on receipt of two postthis pamphlet to any address on receipt of two postage stamps, and we cannot too strongly recommend it to the notice of the intending purchaser.—[ADVI.]

# Patents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specification sof Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are propared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

ment—
Boilers and Furnaces—2021, 2034, 2037, 2040
Buildings and Building Matrhals—2022, 2041, 2059
Chemistry and Photography—2017, 2031, 2042, 2048
Cultivation of the Soil, including agricultural implements and machines—1998, 2001, 2016, 2020, 2025, 2047
Electrical Apparatus—2012, 2060
Fibrous Fablics, including machinery for treating fibre, pulp, paper, &c.—1994, 1995, 2007, 2011, 2019, 2032, 2045, 2051, 2056, 2058, 2064
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2063
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellory, musical instruments, &c.—2022, 2054
GENERAL MACHINERY—2004, 2003, 2013, 2028, 2029, 2035

GENERAL MACHINERY-2004, 2003, 2013, 2028, 2029, 2035.

2040 LIGHTING, HEATING, AND VENTILATING—None. METALS, including apparatus for their manufacture

2043 MISCELLANEOUS—1992, 1996, 1997, 2000, 2014, 2015, 2024, 2039, 2050, 2052, 2057, 2061 ROADS AND VEHICLES, including railway plant and car-ringes, saddlery, and harness, &c.—2003, 2010, 2026, 2030, 2053

2030, 2033 Ships and Boats, including their fittings—1999, 2005, 2044, 2055

STEAM ENGINES—1993, 2002, 2006 WARFARE—2009, 2018, 2933, 2038, 2049, 2062

1992 G. OWEN, Islington. Chess men. Dated June 20

1863.

The inventor constructs his chess board and chess men in either of the two following ways, that is to say, he inserts a magnet or magnets in each square of the chess board, and attaches a disc of thin sheet iron to the base of each pawn and piece, or he inserts a magnet of suitable form in the base of each pawn and piece, and into or upon each square of the chess board he fixes a button or disc of iron. By this contrivance the pawns and pieces are held securely in their places upon the board.—Patent abandoned.

doned.

193 W. UMPHERSTON, Loanhead, Edinburgh. Steam engines. Dated June 20, 1868.

The patentee claims the arrangement of the double motion lever in connection with the auxiliary cut-off valve and governor slide, and of the opener, and of the spring, weight, or other means used for giving the clothing motion, and of the stopper, so as to produce the effects described, and the regulating by means of these the speed of steam engines, so as to secure an almost uniform rate of speed notwithstanding variations of burden, or of steam pressure. The details of the invention are voluminous.—Patent completed.

1994 G. Midwood, Manchester. Treatment of certain reasts yarms or threads. Dated June 20, 1868.

The patentee first opens or breaks up the coloured cotton waste by means of the ordinary well-known machinery hitherto used for opening or breaking up grey waste; and he afterwards mixes the coloured fibres thus obtained with cotton, linen, or other fibres of a superior quality to give them greater strength, and he then cards and spins the fibres thus mixed by means of the ordinary carding and spinning machinery, thus reforming them into yarn or thread which is wound into the form of cops, or on spools for the shuttle of the loom, or for other similar use. Second, he applies the ecoloured or mixed yarn or thread thus reproduced or remade from coloured cleaning waste, to the manufacture of woven fabrics in the ordinary loom in which he employs it principally in the form of west, interweaving it with a stronger warp for the purpose of giving strength to the fabric.—Patent completed.

1995 G. Richardson, Whitefield, Lancashire. Looms.

1995 G. RICHARDSON, Whitefield, Lancashire. L.

1995 G. RICHARDSON, Whitelield, Lancasnire. Looms. Dated June 20, 1668.

The patentee claims the peculiar combination of mechanism consisting of an endless chain of adjustable bows. worked intermittently in connection with the vertical notched bars or treadles, and reciprocating levers actuated by a cam, substantially in the manner and for the purpose, set forth and illustrated.—Patent completed.

set forth and illustrated.—Patent completed.

1996 A. A. COMMON, South Bank, Regent's-park.

Manufacture of stench traps for drains. Dated June 20, 1868.

These improvements do not apply to the manufacture of what is commonly known as the bell trap, but to traps formed by a receiving basin or bowl in the centre of the body, into which bowl dips a piece supported on the upper rim of the said body. The inventor proposes to cast the body outlet and dip of one piece, and to join the bowl to the body in the casting of this latter.—Patent abandoned.

1997 H. W. HART, Bayswater. Urns for containing teac. Dated June 20, 1868.

1997 H. W. HART, Expansion.

Ac. Dated June 20, 1868.

This invention consists in constructing such tea pots, coffee pots, and jugs, vessels, or urns for containing cocoa, chocolate, and such like beverages, with a double casing, the space between the inner and outer casing being filled with a material that is a good non-conductor of heat, such as felt, so that the heat of the beverage shall be prevented from being communicated to the outer casing, and thus lost by radiation therefrom. The inventor prefers, also, to make the cover of the tea pot or other vessel, as also the spout, with a similar double casing.—Patent abandoned.

1000 I Hadden City Flour Mills, London. Apparatus

1998 J. HADLEY, City Flour Mills, London. Apparatus for cleaning and decorticating wheat. Dated June 20, 1868. This invention relates to the cleaning and decorticating

of wheat by subjecting it to friction between stationary and rotating yielding and elastic surfaces. Before submitting the wheat to the decorticating operation the patentee first screens and winnows it by any approved apparatus, and he then passes it between friction surfaces.—Patent completed.

1999 W. R. G. WRIGHT, Glasgow. Propelling of thiss, &c. Dated June 20, 1868.

This invention consists, essentially, in propelling ships or vessels by a new or improved hydraulic propeller, and a reaction hydraulic wheel or motor for actuating the same, driven by the pressure and quantity of water forced through the said screw and wheel for the purpose by any of the usual means and apparatus heretofors in use for forcing water through pipes or conduits, and which compound propeller thus actuated propels the ship or vessel by the combined action of the screw acting direct on the water to be displaced, as usual, by preference, at the stern of the ship, and the reactionary force of the actuating or escaping water of the reaction wheel, acting on the principle of hydraulic jet propellers.—Patent abandoned.

2000 C. H. MURRAY (Loman-street, Southwark. Derice of the state of the state

principle of hydraulic jet propellers.—Patent abandoned. 2000 C. H. MURRAY, Loman-street, Southwark. Dericg for uniting and securing the ends of scraps, &c. Dated June 20, 1868.

This invention consists, chiefly, in the combination of a slotted piece or frame with a wedge, the two ends of a strap being inserted into the aperture in the said piece, and the wedge being placed between the said two ends in such a manner that the greater the strain tending to separate them the more firmly the wedge will bind and secure them.—Patent completed.

2001 J. BONNAL (Grapham, Threating marking Date).

2001 J. BONNALL, Grantham. Thrashing machines. Dated

separate them the more firmly the wedge will bind and secure them.—Patent completed.

2001 J. BONNALL, Grantham. Thrashing machines. Dated June 20, 1868.

This invention relates, first, to a novel construction of the seats or plummer blocks and bearings of thrashing and other machines, whereby they are rendered self-adjusting, and allow any ordinary deflection of the shafts or axles working in them. The invention relates, second, to means of attaching the connecting rods to the shoes or dressing apparatus, and the hangers or vibrating links to the straw shakers. The invention relates, third, to the application of sack elevators to the before-mentioned machines. The invention relates, fourth, to improvements in straw elevators to be used in connection with the before-mentioned thrashing machines. The details of the invention are voluminous.—Patent completed.

2002 J. Shelmerdine, W. Walker, and H. Holt, Manchester. Valve gear for steam and other motice engines. Dated June 20, 1868.

This invention relates to that class of valves where one valve is worked by an eccentric or other means to regulate the admission and exhaustion of the steam, and another valve is applied to the first named or primary valve to be moved with it by the friction caused by the prossure of the steam upon the second valve, this second or supplementary valve acting when its movements are stopped to cut off the supply of steam to the primary valve, which then slides under it, and the object of the invention is an improved arrangement and combination of mechanism to stop the movements of the supplementary valve at different parts of its traverse, so as to cut off the supply of steam to the cylinder at a different part of the stroke of the piston, and thus regulate the expansive working of the steam, this being done by adjusting the valve gear by hand, or by connecting it with a suitable governor, which will vary the time of cutting off the steam according to its pressure, or to the load upon the engine, so as to keep the speed uniform, the fu

the lever.—Patent completed.

2003 J. BAYLISS, Cannon-street. Wrought-iron hurdles, gates, and fencing. Dated June 20, 1868.

This invention appertains to the description of hurdles, gates, or fencing made with rectangular standards, and rectangular rails, and round or oval horizontal or vertical rails, and consists in cutting the rails off to the length required, and in removing as much of the round part of the iron as to form a rectangular tenon and shoulders; and by punching corresponding holes in the standards or bottom or other rail as may be required for receiving the rectangular tenon so formed, they simply require to be riveted or spread over on the outer or extreme ends to complete the hurdle, gate, or fencing to which this mode of manufacture may be applied.—Patent abandoned.

2004 S. BOWEN, C. GLOVER, R. H. DAVIS, T. STANDFORD.

riveted or spread over on the outer or extreme ends to complete the hurdle, gate, or fencing to which this mode of manufacture may be applied.—Patent abandoned.

2004 S. Bowen, C. Glover, R. H. Davis, T. Standford, and T. Scott, Birmingham, and A. M. Ball, E. Silellon, W. Farmer, L. Maskall, E. Coburn, and J. C. Cole. Smethwick, Stafford, Improvements in machinery for cutting or worming screws. Dated June 20, 1868.

This invention consists, first, in arranging a pair of screwing dies, so that they may be opened by self-acting mechanism, constructed as described, the said dies forming what is commonly called a solid die when in the act of cutting or worming free screwing is completed, the opening of the dies releasing the screw. The opening of the dies releasing the screw. The opening of the dies is effected by hand. The invention consists, second, in the use of a quick threaded screw or inclined plane in the front end of the screwing spindle for starting the blank into the screwing dies. The invention consists, third, in fixing in a diagonal position the rods by which the saddle carrying the screwing dies is supported. By this arrangement the said rods are out of the way of the attendant, and afford great facility for arranging the dies. It consists, fourth, in fixing the screwing machine on a hollow pillar or column, in such a manner that the pillar or column may be used for supporting an oll basin, the interior of the pillar or column containing boxes for storing tools or for other purposes; and, lastly, in the general arrangement of the screwing dies, the starting screw, or plane, and the diagonal rods for supporting the saddle carrying the dies hereinbefore referred to in connection with each other, and in combination with the hollow pillar or column hereinbefore referred to.—Patent completed.

2005 V. DE STAINES, Shepperton Villas, London, Boat, &c. Dated June 22, 1868.

First, for the construction in the contrivance of a

longitudinal channel or passage under the boat or vessel by means of two flauches or cheeks, descending one on each side of the vessel, and so confining the water as to give it a greater power of resistance in supporting the vessel, which at a certain velocity will gilde with very little friction on the top of this liquid rail. Second, for the propulsion, in placing the paddle-white, screw, or other propelling power directly in front and in a line with the above channel, so that all the agitation communicated to the water passing under the boat shall contribute to its support and progress as well as any air or gas thereby introduced.—Patent abandoned.

2006 R. and W. K. Austin, Glasgow. Rolary engine.

2006 R. and W. K. AUSTIN, Glasgow. Rotary engines and pumps. Dated June 22, 1868. This invention is not described apart from the drawings

Patent completed.

2007 W. TONGUE, Kennington. Machinery for preparing brows materials for combing and spinning. Dated June 22,

1868.

We cannot here give space to the voluminous details of this invention.—Patent abandoned.

this invention.—Patent abandoned.

2003 E. T. HUGHES, Chancery-lane. Machines for polishing needles. (A communication). Dated June 22, 1868.
This invention relates to improvements in the process of finishing needles after they have been tempered, and consists, first, in the peculiar manner of scouring the needles, whereby the roll or bag is kept in constant revolution, and, second, in mechanism for polishing the needles after they have been scoured. The details of the invention are voluminous.—Patent completed.

are voluminous.—Patent completed.

2009 E. T. HUGHES, Chancery-lane. Metallic cartridges.
(A communication). Dated June 22, 1868.

This invention relates to improvements in metallic cartridges, and especially those designed repeating or magazine arms, the object being threefold:—First, to produce a cartridge that shall be less liable to accidental explosion, both in handling and also in the magazine of the gun. Second, to so strengthen the base or head as to prevent the breaking or pulling off of the flange or head; and, third, to produce a central-fire cartridge, so constructed as to act as a cushion for the purpose of relieving the breech pin more or less from the sudden shock or strain caused by the explosion of the charge. The invention is not fully described apart from the drawings.—Patent completed.

pleted,
2010 W. E. Gedge. Wellington-street, Strand. Means of indicating whether the doors of railway carriages are securely fastened or simply closed. (A communication). Dated June 22, 1868.

It is proposed to indicate the position of the handle on the outside by the words "open," or "closed," or "fastened," placed within the carriage. A fixed plate with, say, a red ground will have inscribed upon it the word "open," and will be visible so long as the door is not completely fastened. A movable plate with, say, a blue ground fixed on the spindle of the handle, and hidden within the panel of the door, comes over the fixed plate when the handle is turned from the exterior to fasten the door. This blue plate will bear an inscription to the effect that the door is fastened.—Patent abandoned.

2011 W. A. GILBEE. South-street, Finsbury. \*Manufacture\*

-Patent abanconed.

2011 W. A. GILBEE, South-street, Finsbury, Manufacture of cards for carding. Dated June 22, 1868.

This invention consists in an improved construction of machine or apparatus for making cards for carding, by which a greater amount of product is obtained than by the ordinary machinery, a whole row of teeth being made and inserted in a sheet or band of leather or india-rubber at each revolution of the driving shaft of the machine.—Patent completed.

Patent completed.

2012 M. Gray, Highbury-hill, near London, and M. Grisson, Silvertown, Essex. Coating or covering electric conductors. Dated June 22, 1868.

The object of the first part of this invention is so to arrange and construct the dies or die plate with respect to the inozzles as to be able to effect the required adjustment of any particular nozzle or dio with facility, and while the covering operation is proceeding. A further improvement in coating electric conductors consists in treating the wires which are to be covered with guita-percha with a preparatory coating for facilitating the adhesion of the guita-percha to the wire. This coating consists of a compound composed of gum balats, resin, oil, and pitch.—Patent completed.

2013 A. M. CLARK. Chancerv-lane. Apparatus for wind-

of guin balata, resin, oil, and pitch.—Patent completed, 2013 A. M. Clark, Chancery-lane. Apparatus for winding thread. (A communication). Dated June 22, 1868.

These improvements relate to the application of a guide or conductor for guiding the thread in an even and regular manner throughout the length of the bobbin or spool, so as to cause it to be wound evenly thereon in successive layers. This thread guide has to and fro motion imparted by means of a cam, eccentric, or other mechanical equivalent, also forming part of the invention.—Patent completed.

completed.

2014 C. Whitehouse. Bridgtown, near Cannock, Stafford. Mill bills and picks for dressing millstones. Dated June 22, 1868.

The patentee claims making the head or frame of the bill or pick of a fixed part, a movable part, and making the acting ends of the said head or frame, separate from the head or frame, the said movable and fixed parts of the head or frame, and the acting ends being constructed, and the acting ends fixed, gripped, and held in the head or frame for use, substantially as described and illustrated.—Patent completed.

-Patent completed.

2015 G. TAYLOR, Bradford. Boots and shoes. Dated June 22, 1868.

This invention consists in making boots and shoes with caoutchouc soles having nipples or projections on their under surface; the inner sole is perforated; and there is a flap valve opening downwards, whereby ventilation to the foot is secured, and great flexibility is imparted to the sole.—Patent completed.

sole.—Patent completed.

2016 J. and J. HAYES, Elton, Huntingdon. Machinery
for actuating strate shakers. Dated June 22, 1863.

This invention relates to a poculiar mechanical arrangement for transmitting a rapid vibratory motion to the
shaker bars of straw shakers, and to the process or riddles
of vibratory screening apparatus, and is particularly applicable to the machinery for shaking, riddling, raising,
and delivering straw and other like agricultural produce,
for which the inventors obtained letters patent, dated
April 16, 1866 (No. 1072).—Patent abandoned.

2017 J. H. JOHNSON, Lincoln's Inn-fields. Red colour. (A communication). Dated June 22, 1868.

This invention relates to the production of a red colour.



from aniline or saits of aniline, and consists in subjecting aniline or saits of the same to the action of a nitrite, by aniline or saits of the same to the action of a nitrite, by a consist of the same to the action of a nitrite, by a contained in a three before-mentioned substances being contained in a suitable ressel or apparatus, heat is to be applied until suitable reselved and the crude mass then the desired colour is produced, and the crude mass then resulting is to be subjected to the action of water, and refer the removal of the soluble saits, the colouring matter site the removal of the soluble saits, the colouring matter is to be dissolved in a solvent of the same, such, for example, as boiling water, or a dilute solution of acid, for example, as boiling water, or a dilute solution of acid, for example, as boiling water, or a dilute solution of acid, and manner well understood by manufacturers of aniline colours.—Patent abandoned.

2018 Lieutenant C. H. M. Downing, Gloncester-terrace,

is to be dissorbling water, or a diffule stotal recompound may then be separated by means of sail, and be purished in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner well understood by manufacturers of fled in a manner within shape which in play freely and not be trigger is pulled, receives the blow of the hammer. The ball cartridge consists of a back of the chamber. The ball cartridge consists of a back of the chamber. The ball cartridge consists of a back of the chamber. The ball cartridge is inserted in the corted or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a flat base, behind conical or other shaped bullet, having a fl

Patent abandoned.

2020 J. and A. Douglas, Strannaer, Wigtown. Reaping and moving machines. Dated June 23, 1868.

This invention relates to improvements in reaping and mowing machines, and consists in placing the cutting mowing machines, and consists in placing the cutting wheels of convenient diameter; one of the pitch wheels is placed at the outer end of the fluger bar, and the pitch is placed at the outer end of the fluger bar, and the pitch wheel which actuates the travelling band or chain is placed wheel which actuates the travelling band or chain is placed to the lower end of a vertical shaft, which is rotated by too the gearing or other suitable means for obtaining rotary motion.—Patent completed.

toothed gearing or other suitable means for obtaining rotary motion.—Patent completed.

2021 C. Johnson, Oxton, Chester. Boilers. [Dated]
June 23, 1868.

These improvements consist, first, in making the water spaces, or the steam and water spaces, as the case may spaces, or the steam and water spaces, as the case may be, of two hollow cylindrical or conical rings, and one or more connecting pipes. The one hollow ring surrounds the other, the outer one being preferably made deeper than the inner, and there is an annular space between the timer, and there is an annular space between the two. The said connecting tube or tubes pass across the two. The said connecting tube or tubes pass across the said annular space, and underneath the inner hollow ring said annular space, and underneath the inner hollow ring said within the said niner hollow ring and over the lireand within the said niner hollow ring and over the lireand within the said niner hollow ring and over the lireand within the said niner hollow ring and over the lireand within the said niner hollow ring from the top. The patents is the combustion chamber, all the products of combustion every. The fuel is supplied through a door in the side, or ey. The fuel is supplied through a door in the side, or ey. The fuel is supplied through a door in the side, or ey. The fuel is supplied through the top the ring from the top. The patente wholly covered and surrounded by brickwork or a casing. Second, in constructing boilers according to the first head Second, in constructing boilers according to the first head of the invention, or any other kind of boilers, for the purchase is formed with vertical or diagonal tubes, therefore is allowed to direulste, when such hollow irrestrate is formed with vertical or diagonal tubes, therefore is allowed to direulste, when such hollow irrestrate is formed with vertical or diagonal tubes, therefore is allowed to direulste, when such hollow irrestrate circulating pipes, as a "water boiler,"—Patent completed.

2022 A. V. Newyon, Cha

completed.

2022 A. V. NEWTON, Chancery-lane.

A communication). Dated June 23, 1868.

This invention is not described apart from the drawings.

—Patent completed.

Patent completed.

Patent completed.

Prick machines

Patent completed.

2023 A. V. NEWTON, Chancery-lane. Brick machines.
(A communication). Dated June 23, 1868.
This invention is not described apart from the drawings.
Patent completed.

2024 P. BROWN, Houghton, and B. BROWN, Huntingdon.
Instrument to be used to ascertain the irregularities in the surface of millistones. Dated June 23, 1868.
At the present time a single straight edge of wood is At the present time a single straight edge of wood is in the present time as ingle straight edge of wood is in the present time as ingle straight edge, so that it gauges the stone only in one straight line across it, the patentees so form the staff as a single time across it, the patentees so form the staff as a single straight line across it, the patentees so form the staff as a single that stone simultaneously in several lines at the same gauge the stone simultaneously in several lines at the same lines at the same time, and so arranged that, should the stone below on time, and so arranged that, should the stone below on the line in the staff may be sure to take a bearing on the lines to detail the staff of the sure to take a bearing on the lines to colour them.—Patent completed.

2025 C. T. Burgess, Brenwood. Reaping and moving

2025 C. T. Burgess, Brentwood. Reaping and moteing suckines. Dated June 23, 1868.
This invention has, firstly, for its object, to improve the lubrication of the working parts of reaping and mowing nuachines. In order to give a constant supply of lubricate

iug material to the crank pin which gives motion to the reciprocating knife or cutter bar, the patentee forms the stem of the connecting rod which connects the crank pin with the knife hollow to form a reservoir for containing a supply of oil; from the end of this hollow reservoir the supply of oil; from the end of this hollow reservoir the supply of oil; from the end of this hollow reservoir the supply as as mall hole through which a wick of cotton is through a small hole through which a wick of cotton is through a small hole through which as explied from the passed; or the oil may be otherwise supplied from the passed; or the oil may be otherwise supplied from the passed of the times, and the times, with oil through a hole in its side, which, at other times, with oil through a hole in its side, which, at other times, is closed by a cork or otherwise. In order to give a constant supply of oil to the bearings of the revolving axos of stant supply of oil to the bearings, and the exterior of this which are open at one end only, and the exterior of this on the outside of the bearing, and from the bottom of this on the outside of the bearing, and from the bottom of this or the outside of the bearing, and from the bottom of the recess, as small hole leads to the inside of the bearing, and shaft. A washer of fiannel or other material may be shaft. A washer of fiannel or other material may be shaft. A washer of fiannel or other material may be shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft. By thus employing a closed oil cup to screw into a shaft

2026 W. Sowerby, Surat, East Indies. Rails to be used n common roads. Dated June 23, 1868.
This invention is not described apart from the drawings.
-Patent completed.

This invention is not described apart from the drawings.

Patent completed.

2028 C. T. SUTTON, Holloway-road, London. Apparatus to illustrate the propulsive force of steam. Dated June 24, 1868. Here the inventor constructs a small or model boat of there the inventor constructs a small or model boat of sheet metal, and arranges it to be propelled by a screw propeller in the following manner:—The boat has a double propeller in the following manner:—The boat has a double propeller in the following manner:—The boat has a following manner:—The same generated inner bottom, and immediately over them there is placed inner bottom, and immediately over them there is placed a boiler, which is filled with water. The steam generated a boiler, which is filled with water. The steam generated in this boiler is conducted away by a pipe on which is an in this boiler is conducted away by a pipe on which is a region, and the steam issues therefrom in a direction at engine, and the steam issues therefrom in a direction at serious the vessel, and the propeller shaft is inclined and stern of the vessel, and the propeller shaft is inclined and stern of the vessel, and the propeller shaft is inclined and stern of the vessel, and the propeller shaft ture on the vessel. The outer end of the propeller shaft turns on the vessel. The outer end of the propeller shaft turns on the vessel. The outer end of the propeller shaft turns on the vessel. The outer end of the propeller shaft turns on the vessel. The outer end of the propeller shaft turns on the vessel. The outer end of the propeller shaft turns on the vessel. The outer end of the propeller shaft turns on the vessel of the vessel and the order of the propeller shaft turns on the vessel of the vessel and the order of the propeller shaft turns on the vessel of the ves

2029 B. T. Moore, Isleworth, near London. Apparatus r protecting water pipes from injury by frost. Dated June 24,

for protecting water pipes from injury by frost. Dated June 24, at 1868.

The patentee claims, first, the application to water pipes The patentee claims, first, the application to water pipes of an apparatus consisting of one or more taps, cocks, or valves with weighted arms or levers, so constructed and armaged in connection with a glass vessel containing water that, on the breaking of such vessel by the freezing water that, on the breaking of such vessel by the freezing water that, on the breaking of such vessel by the freezing of the water the panch or aperture, so as to allow the open an escape branch or aperture, so as to allow the open an escape branch or aperture, so as to allow the open an escape branch or aperture, so as to allow the opening of a plug or valve suspended in such manner over tanks of a plug or valve suspended in such manner over tanks of a plug or valve suspended in such manner over tanks of a plug or valve suspended in such manner over the opening of the service pipe, substantially as and for the purpose set the service pipe, substantially as and for the purpose set the service pipe, substantially as and for the purpose set the service pipe, substantially as and for the such over part of the service pipe, and having a weighted the lower part of the service pipe, and having a weighted the lower part of the service pipe, and having a weighted the lower part of the service pipe, and having a weighted and arranged in such manner that, at or about the same arranged in such manner that, at or about the same and arranged in such manner that, at or about the same that the aforesaid plug closes the upper end of the water to flow out of the pipe, substantially as and for the purposes set forth. —Paten completed.

2030 W. CARR, Manchester. Carriages. Dated June 24, 1868.

2030 W. CARR, Manchester. Carriages. Dated June 24.

The documents relating to this invention are with the two officers (under objection), and cannot at present be

2031 J. GREGORY, King's Wood Iron Works, near Bristol.

pparatus for charring and preparing animal charcoal. Dated

num 24 1868.

2031 J. Gregory, King's Wood Iron Works, near prison.

Apparatus for charring and preparing animal charcoal. Dated
June 24, 1868.

This invention relates to an improved mode of constructing the revolving retorts used in charring the substances
ing the revolving retorts used in charring the substances
made into animal charcoal by inserting in suitable grooves
made inside the retort a perforated plate or perforafixed inside the retort a perforated plate or perforated
inserting in suitable grooves
from, nurrow in comparison with their length, and he
form, nurrow in comparison with their length, and he
form and the perforations of a corresponding series. He finds
thous may be inclined to a corresponding series. He finds
that a plate or series of plates dividing the retort into two
equal divisions may be used with advantage.—Patent abandoned.

doned.

2032 N.C. UNDERWOOD, Gorton, Lancashire. Carding engines. Dated June 24, 1868.

This invention relates to that portion of a carding engine employed in the preparation of cotton, flax, or other other consists in an improved arrangement of parts employed to give motion to the said "doffer."—Patent completed.

to give motion to the said "doffer."—Patent completed.

2033 W. H. CROCKER, Liverpool. Cartridges. Dated June 24, 1868.

The improved cartridge constituting the essence of this motion consists of a metal tube of the required length and diameter connected with the gun with which it is to used, and which it is preferred shall be of drawn metal, by preference of steel, into which is 'cast," tapped, brazed, or soldered a breech-piece or bottom, through the centre of which is formed a small hole, and which aperture is of which is formed a small hole, and which aperture is encircled at a little distance therefrom by an annular encircled at a little distance therefrom the centre of the back of the cartridge case to receive an ordinary percussion cap.—Patent abandoned.

2034 J. MITCHELL Bradford. Formaces. Dated Line 24.

2034 J. MITCHELL, Bradford. Furnaces. Dated June 24,

This invention relates to furnaces or fireplaces of steam. This invention relates to furnaces, and other like boilers, dyeing vessels, puddling furnaces, and other like

purposes where coal is employed for fuel; and the object is to economize the fuel and consume the smoke arising from the combustion thereof, or to prevent its escape into the atmosphere, and the improvements consist in a method of combining, constructing, and arranging such furnaces of firebrick and common brick braced and held together by straps or bars and rods or bolts of iron.—Patent completed.

Patent completed.

2035 J. Owen, Whitefriars-street, London, and T. PATTERSON, Kennington, Surrey. Winches and cranes. Dated
June 24, 1868.

This invention relates to such winches and cranes or
resonant for raising or moving heavy bodies as are
appearatus for raising or moving heavy bodies as are
actuated by steam or other motive fluid, and consists in
actuated by steam or other motive fluid, and consists in
constructing them in such manner that the same moveconstructing them in such manner that the same movement which throws a friction cone into gear to cause the
barrel to rotate with the main shaft also opens a throttle
barrel to rotate with the main shaft also opens a throttle
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2036 Provisional protection has not been granted for this

2037 M. and J. MACKIE, Kilbirnie, Ayr. Steam boilers.
Dated June 24, 1868.
This invention relates to an improved arrangement or
construction of apparatus to be used in connection with
steam generators, and its object is to utilize the heat of
the waste gases of combustion by causing their heat to be
taken up by the feed water.—Patent completed.

2038 T. RESTELL, Birmingham. Military and sporting 7uns. Dated June 24, 1868.
The great length of this invention precludes our quoting it here at sufficient length for an intelligible abstract.—Patent completed.

Patent completed.

2039 T. SMITH, Upper Thames-street. Ventilating boots and shoes. Dated June 24, 1868.

This invention has for its object the ventilation of boots and shoes, and consists in inserting in the heel of the boot or shoe, immediately underneath the upper leather, a thin or shoe, immediately underneath the upper leather, a thin or material, having a hole formed therein for the reception or material, having a hole formed therein for the reception of the upper end of a tube which passes downwards of the upper end of a tube which passes downwards through and is closed at its lower extremity by the leather of the heel. This vertical tube is provided at its upper of the beel. This vertical tube is provided at its upper end, and immediately under the surface of the horizontal end, and immediately under the surface of the horizontal tube which protrudes from the front of the horizontal tube which protrudes from the front of the horizontal tube which protrudes from the front of the heel and communicates with the atmosphere. Through the land communicates with the atmosphere. Through of the boot or shoe under the upper leather, both through of the boot or shoe is perfectly ventilated and the foot of and the boot or shoe is perfectly ventilated and the foot of the wearer maintained agreeably cool.—Patent abandoned the street. Dated June 24 1868.

the wearer maintained agreeably cool.—Patent abandoned 2040 E. B. WILSON, Stockton-on-Tees, Durham. Fursaces. Dated June 24, 1868.

This invention consists in carrying off the gases from 18 invention consists in carrying off the gases from 18 invention consists in carrying off the gases from 18 invention consists in carrying off the gases from 18 invention in the state of the work into a fine or flues, which flue or flues the inventor prefers to make in flues, which flue of sides along the top or beneath the constructed at the sides along the top or beneath the constructed at the sides along the top or beneath the with the ordinary waste gas outlet, and the other end with the generator or gas producer. Into the end of the flue or flues communicating with the gas outlet he injects a flues communicating with the gas outlet he injects a flues communicating with the gas outlet he flue combining of air. This is forced forward into the flue combining of air. This is forced forward into the flue combining with the waste products of combustion, and is caused to with the waste products of combustion, and is caused to point.—Patent abandoned.

2041 R. ELSDON, Brockham, Surrey. Burning lime and

point.—Patent abandoned.

2041 R. Elsdon, Brockham, Surrey. Burning lime and cement. Dated June 24, 1868.

In calcining lime and cement the inventor employs a rotating furnace. He constructs the furnace of a tubular form; it is closed at one end, and at the other it is tapered form; it is closed at one end, and at the other it is tapered transverse section of the tube. This furnace is mounted transverse section of the tube. This furnace is mounted in a frame in such manner that it may be rotated about its longitudinal axis; there is a stud or axis fixed at the its longitudinal axis; there is a stud or axis fixed at the in a bearing on the frame. At the other end of the frame in a bearing on the frame. At the other end of the frame is understood in the mouth. The frame also furnace immediately behind the mouth. The frame also furnace immediately its length, so as not to interfere with its intermediate of its length, so as not to interfere with intermediate of its length, so as not to interfere with its intermediate. There is much other detail.—Patent abandoned.

rotation. There is much other detail.—Patent abandoned.

2042 E. Mucklow. Bury. Lancashire. Utilizing refuse
tanning matters for dyeing purposes. Dated June 25, 186s.
This invention relates to utilizing the waste or refuse
material employed by tanners, such as the spent oak,
material employed by tanners, such as the spent oak,
myrabolams, dividivit, gambler, and all similar materials,
myrabolams, dividivit, gambler, and all similar materials,
after the same has been used in tanning hides and skins.

—Patent completed.

2043 J. Bridge. Barrow. Lancashire.

Patent completed.

2013 J. Brider, Barrow, Lancashire. Constructing ingot noulds. Dated June 25, 1868.

An extension of time for completing this patent having seen petitioned for and granted, the documents relating to the invention cannot at present be seen.

to the invention cannot at present be seer.

2044 J. Jack, Liverpool. Auxiliary scree propellers to sating ships. Dated June 25, 1868.

The object of this invention is to provide sailing ships with auxiliary screw propellers capable of propelling with auxiliary screw propellers capable of propelling with auxiliary screw propellers capable of propelling them during calms and adverse light winds; and at other times such propellers are so arranged, and the ships to times such propellers are so arranged, and the ships to which they are fitted so constructed, that the screw, with which they are fitted so constructed, that the screw, with which they are fitted so constructed, that the screw, with our being removed from the shaft, can, when not required for propelling purposes, be housed in a recess formed for propelling purposes, be housed as aforesaid, the working space. When the screw is housed as aforesaid, the working space when the screw is housed as aforesaid, the working space when the screw is housed as aforesaid, the working space when the screw is housed as aforesaid, the working space when the screw is housed as aforesaid, the working space when the screw is housed as aforesaid, the working space.

Patent completed.

2045 E. LEYER, Denton, Lancashire. Coating of woren fabrics. Dated June 25, 1868.

This invention consists in the application and use of paper pulp or fibrous pulp to the surfaces of woven fabrics, paper pulp or fibrous pulp to the surfaces of woven fabrics, and applied thereto in a liquid or pulp-like state, so as to enter and fill the interstices between the warp and weft.—

Patent abandoned

2046 A. D. AULTON, Walsall, Stafford. Sewing machines. Dated June 25, 1868. Sewing machines have hitherto been driven by means

of a foot treadle, hand crank, or, occasionally, by steam power. The object of this invention is to provide another motive power, better adapted for the purpose for which it is intended to be applied. The motive power the inventor employs, consists, substantially, of a coiled spring which is wound round an axis.—Patent abandoned.

inventor employs, consists, substantially, of a colled spring which is wound round an axis.—Patent abandoned.

2047 J. G. GARRARD, Harlow. Rick cloths. Dated June 25, 1868.

The patentee claims the adaptation and application to ricks of a cloth composed of canvas, felt, or other suitable material with an opening, by means of which it can be folded in, so as to make it fit the tops of ricks of different sizes, as described.—Patent completed.

2048 Rev. H. Highton, M.A., Brighton. Manufacture of artificial stone or slate. Dated June 25, 1868.

The patentee is aware that sulphate of alumina and chloride of barmim, and other salts mutually decomposing each other, have been used for hardening the surfaces of stone, and salts of iron, and other metals, for dyeing artical stone, and, therefore, he only claims the use of these methods of colouring when applied to blocks of artificial stone or slate, made as described.—Patent completed.

2049 G. T. Boustield, Briston. Fivearms and cartridges. (A communication). Dated June 25, 1868.

The patentee claims the application to cartridges of cupped discs of cloth, felt, or other similar material, in the manner described, such cartridges being made of a diameter exactly equal to that of the bore of the gun, as and for the purposes described. Second, the construction and application of extraction with or without a spring or lever for throwing out the cartridge case, arranged substantially in the manner shown and described. Third, modifying existing cartridges, in the manner described, to enable the cases to be extracted after firing. Fourth, in constructing paper cartidges so as to retain the bullet without tying; as also the peculiar mode of filling such cartridges, all as described.—Fifth, the improvements in gun actions, arranged and operating substantially in the manner shown and described.—Patent completed.

2050 J. Hine, Occkermouth. Cutting or dressing millistones.

gan actions, arranged and operating substantially in the manner shown and described.—Parent completed.

2050 J. Hine, Cockermouth. Cutting or dressing millstones. Dated June 26, 1868.

This invention relates to apparatus for facilitating the cutting or dressing of millstones by hand by means of diamonds or other hard stones or cutters. The apparatus consists of parallel bars connected together by links in the manner of a parallel ruler of suitable size, through one bar of which passes a screw working in a screw-nut fixed thereon ina central position. The one end of the said screw is received in a longitudinal groove made in the inside face of the other or movable bar, the other or projecting end of the screw being provided with a thumbhead to facilitate turning. Metal plates are also fixed on the inner face of the movable bar taking into a neck formed on the end of the screw in either direction; the movable bar is moved towards or away from the fixed one, in the manner of a parallel ruler. The fixed bar is provided with a stop or projection at either end, which bear against the furrow in the stone on the side furthest from the surface to be cut, by means of which the bar is held steady when in use. These stops are provided on both sides, to enable the apparatus to be reversed when required. The cutting tool consists of a diamond or other hard stone mounted in a suitable holder, and recessed into a metal block somewhat resembling a plane, the diamond cutters or cutters projecting from the under face thereof. The block, which is provided with a handle, is passed over the surface of the stone in the manner of a plane, being guided in its motion by the movable bar before mentioned, against the face of which it bears. After each passage of the cutting tool the movable bar is advanced a cortain distance by turning the screw, and the tool again moved across the surface of the stone as before, thus producing parallel lines or cuts of great regularity. The parallel apparatus is transferred to each furrow successively to

sively to complete the cutting or dressing of the surface.—Patient completed.

2051 C. Hastings, J. Briggs, and J. Law, Bradford. Apparatus for finishing yarns. Dated June 26, 1868.

The object of this invention is to remove the impurities from and clongate and straighten worsted and other yarn either after or before it has been singed or otherwise prepared. In performing this invention the patentees cause the yarn to pass through a trough containing a hot solution of soap and water, or a hot or cold solution of either ingredients, to prepare the yarn, which, before it passes into the trough, is operated upon by a brush or other cquivalent to remove the loose impurities. The trough is provided with one or more guide rails to give friction to the yarn, and with a heating apparatus to keep the solution warm, and after the yarn has passed through the solution warm, and after the yarn has passed through the solution it is wound on to bobbins while still wet; by this means the yarn is considerably improved in appearance, and is in better condition for the loom or for any other subsequent operation.—Patent completed.

2052 C. D. Abel, Southampton-buildings, Chancery-lane.

2052 C. D. ABEL, Southampton-buildings, Chancery-lane Apparatus for cleansing or washing bottles. (A communication). Dated June 26, 1868.

This invention has reference to new or improved

This invention has reference to new or improved machinery or apparatus for simultaneously and effectually cleansing both the interior and exterior of bottles. We cannot here quote the details of the invention.—Patent abandoned.

2053 T. DODD, Crumlin, Monmouth. Arrangements for overing and uncovering railway trucks, &c. Dated June 26,

1868.
This invention has for its object the construction of railway trucks and waggons with readily movable tops, roofs, or covers, each such top, roof, or cover being supported on a roller fixed upon the truck or waggon, which movable top, roof, or cover, when required to be used for protecting the inside or contents of the truck or waggon, is rolled on or covers the same by turning the said roller so as to unroll or unfold the same. The invention is not described apart from the drawings.—Patent completed.

2054 T. Burke, Liverpool. Folding chairs. Dated June 26,

1868.

The object of the first part of this invention is to furnish chairs constructed with ordinary or convenient diagonal cross legs and flexible or other seats, with folding backs, each such back being free to be moved so as to serve at pleasure as a back rest on either of two sides of the seat. For this purpose the patentee makes the said folding back of two side-frame pleces, and a transverse rail, and con-

nects the former by pin or other joints to the two outer diagonal cross legs at points below the centres which connect the cross legs. The said folding back is made long enough to rise above the seat any desired distance, and it can, as aforesaid, be moved from one side to the other at will, stops on the sides of the cross rails being provided to prevent it folding over too far, and to serve as a support. This chair is specially suitable for use on board ship; it is also serviceable for general use. The second part of the invention relates to that class of folding chair constructed with diagonal cross legs, a seat hinged to the back rail, and a downwards and forwards folding back, and consists as means for supporting the back frame, and, consequently, strengtheving the chair, as a whole of a transverse stop-piece affixed to the two back legs or near the top thereof at a point above the joints which connect the back to the legs. Chairs of this description fold up in very small space, and by being strengthened as described are rendered serviceable and durable.—Patent completed. completed.

2055 T. WINDER, Liverpool. Marine chain stoppers. Dated June 26, 1868.

Dated June 26, 1868.

This invention relates to improvements in the construction of that class of marine chain stoppers known as elastic stoppers, in consequence of certain parts thereof yielding or giving when the chain or cable is drawn "taut," and consists, first, in the employment of one or more springs of a novel construction placed between the fixed and movable frames. These springs are made of india-rubber or other elastic gum, and each one in form resembles the frastrum of a hollow cone. Second, in employing on the movable frame an eccentric and lever to raise and lower the "catch bit."—Patent completed.

2058 R. CLOUGH. Keighley, York, Loons. Dated

2056 R. CLOUGH, Keighley, York. Looms. June 26, 1868

2056 R. CLOUGH, Keighley, York. Looms. Dated June 26, 1868.

This invention relates to means of working healds or heddles of looms employed for weaving fabrics, technically known as "lastings" and "serge de berries," and the object is to enable the weights employed for lifting the said healds or heddles to be regulated or adjusted in their weight or pressure according to the sort or quality of cloth to be woren without having the said weights to change, as heretofore. For this purpose the patentee employs a series of ordinary jack rods and levers (instead of the bowls or pulleys and cords now used), to attach the top parts of the healds to the bottoms being attached to levers operated by treading tappets as usual, and he employs a series of levers, each being hinged at one end to the loom end frame, and the other attached by cord or rod to a lever fixed on one of the jack rods. The weights are attached to these levers and are capable of being moved thereon, as required, so as to regulate or adjust their pressure or action on the healds in lifting them.—Patent completed.

2057 S. S. MAURICE, Monkwell-street, Wood-street,

completed.

2057 S. S. MAURICE, Monkwell-street, Wood-street, London. Fastening for neckties, &c. Dated June 26, 1863.

This invention consists of a roller or piece shaped as described, mounted and working eccentrically, in such manner that, when worked in one direction, it exerts pressure on and retains in place the tongue, slide, band, or movable piece of the necktie or other article to which the said fastening is applied, and which tongue, slide, or movable piece it releases when worked in the other direction.—Patent completed.

2058 J. TAYLOR, Castle Iron Works, Staleybridge, Cheshire. Opening, cleaning, and preparing cotton, &c. Dated June 26, 1868.
This invention consists in arranging or combining two machines for opening, cleaning, and preparing cotton and other fibrous materials, of that class in which the material is fed and discharged from the same side of the machine, so that the material fed to and operated upon by one machine will be conveyed by mechanism and fed to the other machine, while the two machines may be so arranged as to be used singly if required.—Patent abandoned.

2059 A. THOMSON, Southampton. Water-closets. Dated June 26, 1868.

This invention consists in constructing water-closets in which a disc valve which closes the bottom of the pan is moved on one side clear of the pan, when a handle in the seat, or in other position is moved in a curved slot or otherwise, while, by the same movement, a valve for admitting a supply of water to the flush pipe is opened and the pan is thus flushed.—Patent completed.

pipe is opened and the pan is thus nusned.—ratent completed.

2000 T. H. HOLMES, Gravesend, Kent. Electro-magnetic and magneto-electric machines. Dated June 26, 1868.
This invention consists, first, of a new form of electro-magnet composed of two discs, both of which are hollowed on one side and rounded or made convex on the other; from the edges of these discs project arms which are placed at such distances apart that, when the two discs are brought with their concave sides facing and near to each other, the arms will not be too close. These arms are curved or so applied to the discs that, when the latter are fixed on a shaft, and at a certain distance, they form a ring with poles alternately north and south, and are in the same plane. These electro-magnets may be manufactured of steel or wrought or cast iron, or of any mixtures or combinations of metals susceptible of being converted into magnets. The invention consists, second, of certain new forms of holices or coils, the cores of which are made of two pieces of half-round iron, or of two pieces of iron having a flat side.—Patent completed.

2061 L. Thomas, Leadenhall-street. Apparatus to be

pieces of iron having a flat side.—Patent completed.

2061 L. Thomas, Leadenhall-street. Apparatus to be used along shore for the distillation of pure water from salt water. Dated Juno 26, 1863.

This invention consists, first, in so constructing condensers that they can be placed (and the so placing of them) right into or under the water of the sea or river or lake where they may be used. Second, in disponsing with the outer shell or casing of condensers; and, third, using by this peculiar arrangement of the steam pressure to bortel the distilled water into a tank or reservoir ashore.—Patent completed.

Patent completed.

2062 A. H. Brandon, Paris. Metallic cartridge shells and heads. (A communication). Dated June 26, 1868.

This invention consists in making a cast or stuck-up cartridge shell and head in one piece with pure tin, or an alloy of tin and lead, or other metals, or lead alone, the said cartridge case baving the usual priming tube formed in it or not, and having a plate of metal surrounding the priming tube or without the said plate. The principle of the invention is the making a cartridge case and head with the above mentioned metal or mixture of metals at one

operation either by striking or casting.

doned.

2063 T. C. BLANCHFLOWER, Great Yarmouth. Packing preserved meats and fruits for sale. Dated June 26, 1868.

This invention consists in using a disc of glazed earthenware or glass of such size and shape that it shall fit the pot or vessel that is to receive the animal or regetable preserve, and the disc the patentee places and allows to rest upon the preserve, by which means the air will be effectually excluded therefrom.—Patent completed.

2064 A. H. Brandon, Paris. Machinery for spinning hamp, &c. (A communication). Dated June 26, 1868.

This invention is not described apart from the drawings.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT.

Dated December 29, 1868.
3952 C. D. Abel, Southampton-buildings, Chancery-lane.
Improvements in the manufacture of wrought metal pipes, and in the apparatus employed for that purpose. (A com-

and in the apparatus employed for that purpose. (A communication).

3953 J. A. A. Landa, Cour des Miracles, Paris. An improved machinery for engraving letters, medallions, and other ornaments on stone or metal.

3954 A. Browne, King William-street, City. Improved methods and processes of manufacturing illuminating gas, and apparatus to be employed therein and therefor, and in treating the products of such processes to improve and increase their commercial value. (A communication).

3955 I. Pick, Silver-street, Falcon-square, City. Improvements in the manufacture of travelling and hand bags.

provements in the manufacture or production of printing sur-

faces. 3957 J. Gillman, Wolverhampton. A contracting lever

scale, 3958 F. N. Gisborne, West Strand, Middlesex. Improve ments in means or apparatus for giving motion to sewing

ments in means or apparatus for giving motion to sewing and other machines.

3959 G. T. Bousfield, Loughborough Park, Brixton, Surrey. Improvements in extracting the colouring matter of madder root from the liqueous matter of the plant. (A communication).

3960 G. Slater, Lamb's-passage, Middlesex. An improved machine for plaiting or doubling strips or sheets of cloth, paper, and other materials.

3961 J. Marsh, Westminster. Improvements in covering or capping bottles, jars, and other surfaces.

Dated December 30, 1868.

3962 R. and T. Hughes, New Cross, Surrey. Improvements in velocipedes.

3962 R. and T. Hughes, New Cross, Surrey. Improvements in velocipedes.
3963 J. Laurie and J. Whittaker, Seacombe Forge Rivet and Bolt Works, Chester. Improvements in machinery for screwing and tapping.
3964 S. and W. Fox and J. Reffitt, Silver Cross Works Leeds, and G. Grange, Pately Bridge, Yorkshire. Improvements in machinery or apparatus for cutting and shaping wood or other materials.
3965 A. G. Cazalat, Rue Gaillon, Parls. Improvements in the manufacture of steel.
3966 J. and Λ. Hutcheson, Glasgow. A new or improved elevator.

3966 J. and A. Hutenesou, Glasson.

elevator.
3967 T. F. Henley, Pimlico. Improved means of operating upon stick or gum hac for the extraction of colouring matter or lac dye, and for the production of shellac.
3968 J. H. Johnson, Lincoln's Inn-fields. Improvements in the manufacture of paper tubes employed in the spinning of wool and other fibrous substances, and in the machinery or apparatus employed therein. (A communication).

3969 W. Winter, Leeds. Improvements in sewing machine

machines.

3970 C. Monestier and I. Bang, Roulevard St. Michel, Paris. Improvements in the preparation of impermeable paper for manufacturing several fabrics or articles.

3971 G. Davies, St. Ann's-square, Manchester. Improvements in separating ores and other materials, and in apparatus therefor. (A communication).

3972 P. and R. Gornall, Blackburn. Improvements in the long collars of roving and slubbing frames used in the manufacture of cotton or other fibrous material.

3973 H. H. Blgg, Wimpole-street, Cavendisb-square, Middlesex. Improvements in the construction of artificial legs.

legs.

3974 E. T. Noualhier, Paris. Improvements in apparatus for supplying, blowing in, and exhausting air, producing draft, and ventilating.

3975 J. Gedge, Lee House, Addington-square, Margate, Kent. Improvements in the manufacture of gas apparatus or fittings.

Dated December 31, 1868.

3976 H. A. Bonneville, Sackville-street, Piccadilly. A new and improved apparatus for drying and growing malt and all other grains, fruits, or vegetables. (A communication).

mait and all other grains, truits, or vegetables. (A communication).

3977 C. do Bergue, Strand. Improvements in the permanent way of railways and of street tramways.

3978 W. E. Gedge, Wellington-street, Strand. A novel kind of sweetmeat. (A communication).

3979 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in spinning machines. (A communication).

laue. Improvements in spinning machines. (A communication).
3980 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in machinery for untwisting and separating the fibres of hair ropes. (A communication).
3981 F. A. K. W. von Oppen, Pall Mall. Improvements in revolving breech-loading firearms, and in cartridges for the same, and in devices attached to the said firearms for charging the cartridges. (A communication).
3282 A. Barelay, Kilmarnock, Ayrshire. Improvements in air numps.

3282 A. Barelay, Kilmarnock, Ayrshire. Improvements in air pumps.
3283 B. Samuelson, Banbury, Oxfordshire. Improvements in the manufacture of iron and steel, and in the apparatus connected therewith.
3984 D. Spill, Paradise-terrace, Hackney, Middlesex, Improvements in the production of compounds containing xyloidine.
3985 G. M. Wells, Belitha Villas, Barnsbury, Middlesex, Improvements in wrenches. (A communication.)
3986 H. E. Newton, Chancery-lane. Improvements in washing machines. (A communication.)
3987 W. E. Newton, Chancery-lane. Improvements in revolving firearms, and in cartridges for the same, and for other firearms. (A communication.)



3988 B. Griffiths, Rhual Issa, near Mold. Flintshire. Improvements in propelling vessels, and in the arrangement and construction of screw propellers and apparatus

ment and construction of screw propellers and apparatus connected therewith.

3899 T. Gibson, Newcastle-on-Tyne, Northumberland. Improvements in buffers to be used on railways.

3990 J. Seelig, Bunhill-row, Middlesex. Improvements in the manufacture and ventilation of hats.

3991 C. Shales, Westbourne-grove, Middlesex. Improvements in tatting shuttles, and in the mode of winding thread thereon.

pated January 1, 1869.

1 J. Heap, Ashton-under-Lyne, Lancashire. A new system of gearing, which is applicable to lathes, planing, drilling, shaping, and screwing machines, and also applicable in all cases where an extra purchase or concentration of mechanical power is required.

2 T. Singleton, Over Darwen, Lancashire. Improvements in machinery or apparatus used in the preparation of yarn, and in the manufacture thereof into textile fabrics, as Lyons, Wilson-street, Finsbury, Middlesex. The mode of producing and employing devices and designs upon textile fabrics for certain articles of dress.

4 W. M. Williams, Sheffield. Improvements in fettling or lining puddling furnaces used in the manufacture of iron and steel.

5 G. Smith, Strand. Improvements in machinery for clipping horses and sheep, also applicable to reaping grain, reaping sugar cane, for cutting down trees, cutting cloth, and for other similar purposes.

6 T. Green, Smithfield Iron Works, Leeds. Improvements in steam and other boilers.

7 T. Green, Smithfield Iron Works, Leeds, W. Barrows, and R. Turner, Leeds, Improvements in bushing the bung-holes of casks and other vessels.

8 B. G. George, Hatton-garden, Middlesex. Improvements in the manufacture of show cards, almanacks, book covers, and other ornamental surfaces.

9 F. Perry, Fenchurch-street, City. An improved process for preserving animal and vegetable substances from decay, and also for preserving fermented liquors. (A communication).

decay, and also for preserving fermented liquors. (A communication).

10 M. Henry, Fleet-street, City. Improvements in machinery or apparatus for combing fibrous materials. (A communication).

Machinery or apparatus for combing fibrous materials.

(A communication).

Dated January 2, 1869.

11 J. H. Johnson, Lincoln's Inn-fields. Improvements in certain vehicles commonly known as velocipedes. (A communication).

12 S. Smith, Heekmondwike, Yorkshire, D. G. Senior, and J. Inman, Brighouse, Yorkshire. Improvements in taps and valves.

13 A. Batchelar, Brockham, Surrey. Improvements in kilns for burning bricks, tiles, pottery, lime, cement, and other similar articles.

14 W. G. Rawbone, Birmingham. Improvements in apparatus to be used in converting breech-loading fireams in muzzle-loading fireams.

15 A. Carter, Birmingham, and C. R. E. Grubb, Dalston Middlesex. An improvement in candlesticks.

16 J. G. Tongue, Southampton-buildings, Chancery-lane. Improvements in apparatus for sewing or stitching together the numbers or separate parts of a volume in the operation of book-binding. (A communication).

together the numbers or separate parts of a votame in the operation of book-binding. (A communication).

17 M. Wolfsky, Pilgrim-street, Ludgate-hill, City. Improvements in locks or fastenings for purses, satchels, pocket-books, and similar articles.

18 H. A. Bonneville, Sackville-street, Piccadilly, Certain improvements in the process of refining iron and making steel, and in the apparatus used in carrying out said process. (A communication).

19 W. A. Biddell, Edward-street, Parade, Birmingham. The improvement in the manufacture and ornamentations of chandeliers, lamps, lustres, and other articles.

20 S. J. Peet, Leeds. Improvements in valves or cocks. 21 J. M-Kenuy, Dublin. Improvements applicable to the shoes of horses and other animals.

22 J. Major, H. Trigg, and W. Wright, Swallow-street, Middlesex. Improvements in the production of white lead.

NOTICES OF INTENTION TO PROCEED WITH
PATENTS.
From the "London Gazette," January 5, 1869.
2611 D. Evans. Metallic casks.
2613 T. Wrigley and J. Holding. Looms for weaving.
2628 W. R. Lake. Cartridges for breech-loading firearms. (A communication).
2629 O. C. Setchell. Composition applicable to the
manufacture of bricks.
2636 G. S. Dracopulo. Apparatus for raising water.
2636 R. Scholefield. Brick-making machinery.
2636 R. W. Morgan. Machine for mowing.
2652 R. W. Morgan. Machine for mowing.
2654 W. L. Williams. Motive-power engine.
2657 J. Hanson. Breech-loading firearms.
2663 D. Smith. Smoke-consuming apparatus.
2663 D. Smith. Smoke-consuming apparatus.
2668 G. Ker. Apparatus for cleaning gloves.
2670 B. Corcoran and W. Dunham. Apparatus for
dressing millstones.
2673 C. H. Gardener. Zincographic cylinder printing
machines.
2674 E. Richardson, Material for manufacturing

Richardson, Material for manufacturing machines.

2673 C. H. Richardson, Material for manufacturing 2674 E. Richardson, Material for manufacturing 2684 W. S. Fletcher. Apparatus for preventing the 2684 W. S. Fletcher. Apparatus for preventing the admission of draughts of air through the apertures of doors and windows.

2687 T. Lester and W. Trueman. Steam engines.

2688 J. Fieldhouse. Furnaces of steam boilers.

2689 L. F. A. P. Riviere. Cases for packing bottles.

2700 W. C. Holmes. Apparatus used in the manufacture of gas. (A communication).

2703 E. Jobson. Planofortes.

2713 J. Evans. Machizery for finishing and welding iron and steel tubes.

2721 A. M. Clark. Camp bedstead and travelling trunk.

2722 E. L. Parker. Fastenings for braces.

2727 T. Butterworth. Pump.

2747 J. Wood. Frog plates.

2815 W. R. Lake. Manufacturing brushes. (A communication).

munication).
2834 C. de Bergue. Gas cooking stoves.

2859 W. R. Lake. Manufacture of heads for dolls. (A

2859 W. R. Lake. Manufacture of heads for dolls. (A communication).
2864 A. F. Campbell. Ships.
2910 W. J. H. Grout. Tobacco pipes.
3144 W. R. Lake. Machinery for spinning wool. (A communication).
3230 M. A. F. Mennons. Engine for raising and forcing water. (A communication).

3230 M. A. F. Mennons. Engine for raising and foreing water. (A communication).
3532 W. R. Lake. Means for operating reciprocating saws. (A communication).
3594 J. Bourne. Production of heat.
3665 T. Warburton. Piecing cardings of cotton or weed.

wool. 3685 W. Simpson and J. Hutton. Lubricating appa-

wool.

3685 W. Simpson and J. Hutton. Lubricating apparatus.

3687 W. R. Lake. Machine for cutting edible roots.

(A communication).

3780 Z. Poirier. Safety stopper for bottles.

3782 C. E. Brooman. Apparatus for indicating hours and days. (A communication).

3814 J. Frazer and W. Naar. Mattresses.

3857 T. B. Salter and J. Silvester. Steam gauges.

3860 D. Imhof. Chimes.

3884 J. S. Walker. Machinery for undermining coal.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

### LIST OF SEALED PATENTS Sealed Jan

Sealed Janus	ry 1, 1869.
2108 L. Francis 2110 W. Dean and R. Andrew 2115 D. Hall 2127 G. Bennett and J. Woodcock 2132 J. A. Muller 2133 J. Head 2137 E. H. Newby 2139 T. G. Messenger 2143 P. Jensen 2146 E. H. Waldenstrom	2177 J. Harris and Pendred 2182 T. Worth 2230 R. Couty and Richard 2247 W. I. Ellis 2283 A. Homfray 2370 A. Morrall 3122 W. Moodie 3198 H. A. Bonneville 3489 H. A. Bonneville

2147 J. H. Wilson 2150 G. R. Wilson 2151 T. J. Mayall 2152 E. Coppee 2154 J. Lawson and E. G. Fitton 2155 T. R. Crampton 2156 B. P. Walker 2159 T. J. Mayall 2160 T. J. Mayall 2164 J. Holt and G. S. Coponet 2165 J. Prest, W. Mather, 226	, 1869.  88 E. Coppee 71 E. Rouget 76 W. Creasy 81 W. R. Oswald 84 J. H. Johnson 93 W. Russell 98 J. D. Brunton 70 A. Muuro and W. B. Adamson 81 T. Wood 61 D. Webster 302 I. Dulac 446 E. Evans 653 C. F. Varley
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PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

34 F. Wright 30 T. E. Vickers 12 P. S. Bruff 3376 R. Smith 194 W. K. Hall 81 W. E. Newton 42 E. Walker

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

55 J. Stenhouse

LIST OF SPECIFICATIONS PUBLISHED. For the week ending January 2, 1869

To.	Pr.	No.	Pr.	No.	Pr.	No.		No.	Pr.	No.	Pr.
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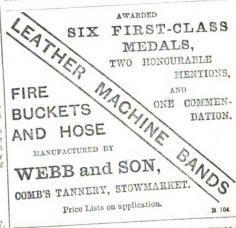
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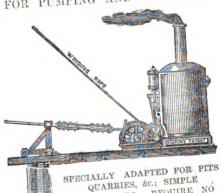
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## MECHANICS' MAGAZINE.

LONDON: FRIDAY, JANUARY 15, 1869.

#### SYSTEMS OF DRAINAGE.

WHATEVER success may have attended the partial introduction of the "dry earth" method in isolated districts and pe culiar localities, it cannot be included in the category of drainage and sewerage systems. Its advocates appear now to be convinced of the utter futility of endeavouring to extend its sphere of application beyond its legitimate limits. At one time they entertained the preposterous and extravagant notion of adapting the principle to the requirements of large towns, and even metropolitan cities. Gradually, these unfounded expectations have subsided. The numerous attempts undertaken with the view of securing the co-operation and influence of local boards have proved entire failures, and while there is no doubt of the value of the "dry earth" principle in the case of barracks, hospitals, outlying districts, and localities where no drainage exists, there is equally not the slightest doubt that it is not, and never can be, rendered available for the exigencies of a large city. Independently of the re-pugnance that people of English tastes, habits, and proclivities would unquestionably manifest towards the using of the earth, its subsequent desiccation, and ultimate re-uti-lization, we maintain that the principle per se is defective and incomplete when regarded from a point of view sufficiently comprehensive to embrace every instance that might present itself. That dry earth is a most effectual deodorizer will be universally admitted, and if every individual farmed his own small portion of land, and sat under his own vine and his own fig tree, it would be impossible to devise a more simple or more ready method of utilizing sewage matter. But as this primitive phase of existence is not in accordance with the progress of European civilization, means that are admirably adapted for promoting the same end under one régime are not admissible under the regulations of another. The dry earth method bears some resemblance to the "separate" system, which we shall consider presently, insomuch as it makes no provision for the removal of any of the house or kitchen refuse, or of the storm and surface water.

Omitting all further consideration of this imperfect and incomplete method, we will now investigate the three bona fide systems, and briefly examine into their relative capabilities and advantages for effecting the desired result. They may be classed under the heads of the single, the double, and the mixed systems, and, in addition, are all included under the general term of "sewage by water carriage," in contradistinction to the dry method to which we alluded at the commencement of the present article. The single or separate system is that in which the sewers are considered strictly as such and They serve as channels for the conveyance of sewage matter alone; and no other refuse, fluid or solid, is permitted to form part of their contents. The double system is the most comprehensive of the three, and the sewers take everything they can get in the shape of sewage matter, house drainage, rain, and surface water, and, in fact, everything that is not too large to pass the grat-ings and traps of the drains. Under the third classification, or the mixed system, we have a compromise between the other. A certain portion of the surface water and street drainage passes into the sewers, while the re-mainder is carried off by other channels, and frequently by open watercourses,

gation is the only efficient method of utilizing town sewage is now a truism, incontestably established by the results of actual experience and agricultural experiments. quently, the whole question turns upon the relative advantages of permitting the surface drainage and storm waters to form a portion of the contents of the channels which serve for the transport of the sewage matter. consideration of this point may be regarded as of a twofold character—the one concerns the immediate and rapid removal of the sewage from the vicinity of human dwellings; the other its subsequent utilization. The first of these is unquestionably the more important, and deserves the greatest attention. It is the sine qua non of every sanitary measure and precaution undertaken for the wel-fare of any district, urban or rural. The fare of any district, urban or rural. second is likewise of considerable and grave interest, but nevertheless in some degree subsidiary to or contingent upon the first. It is upon this rock that all the advocates for the dry earth principle have split, when they endeavoured to apply it upon an extensive scale. They make the conversion of the sewage into manure and its utilization the primary consideration, and its removal from the habitations of men the secondary; thus virtually putting the cart before the horse. plan of constructing, as is necessary in the "single" system. separate surface and the sewage drainage, it would be the enormous and unwarrantable expense that must of necessity be incurred. Imagine London with a duplicate system of "metropolitan drainage"! Again, what is the object to be gained by the adoption of separate channels? A certain quantity of water is absolutely necessary to act as the transporting power for the sewage, and, in cases where the fall is unavoidably very slight, artificial means of flushing have to be resorted to. Where can this power be so conveniently and cheaply obtained as from the surface drainage? We shall not allude to the unnedrainage? cessary expense that must attend the construction of storage reservoirs and settling tanks, -and all for what? To deduct from the sewage channels a portion of their contents. The only other argument against running off the surface drainage in the sewage channel is that it dilutes and deteriorates the sewage itself, thereby rendering it less suitable for irrigation. This argument is more specious than real, and experience has not confirmed its validity. It, besides, omits the prominent fact that the water in sewage is frequently of as much value as the fertilizing ingredients, especially on very dry land, and during a season like the past. All solid manures artificially prepared from sewage and applied to the land, have resulted in miserable failure, and utterly disappointed the hopes entertained by their advocates with respect to both the anticipated sale and agricultural value. results of the application of the metropolitan sewage, taken direct from the main sewer, to every description of green and cereal crops upon the farm at Barking, is an indisputable proof of its fertilizing powers. The success of sewage irrigation over every other method of manuring the ground is due to the fact that it combines the two elements of fertilization and irrigation. Each of these, exemplified by simple farm manure and by water, is itself efficacious to a certain extent, and it is therefore no wonder that when combined they should endue the land to which they are applied with unexampled fecundity.

The mixed system is hardly deserving of consideration, as it is simply an entrenchment upon the features of the other two, without possessing any distinct ones of its own. It is open to the objections urged against the single system, and is endorsed

neutral ground upon which the advocates of either of the other two systems might be reconciled. But as we are opposed to compromises of a scientific nature, we shall dismiss the mixed system as one not liable to meet with much favour from engineers. double system is indubitably that to which we give the preference on all accounts. It is that adopted in the largest and most populous city in the whole world; it is the most rapid, most cleanly, most effective method of removing the offensive matter from human habitations, and most in consonance with civilized tastes and prejudices. That it is also the best in a sanitary point of view is evidenced by the circumstance that London, for its population in relation to area, is the most healthy city in Europe. The remaining argument against the double method, namely, that the sewage becomes so extremely diluted as to be of little or no value as manure, is abundantly disproved by the success of the Lodge Farm at Barking. Whatever objec-tions may be raised by the partizans of the single principle with respect to deficient ventilation is equally applicable to their own case. If sewers which convey sewage matter alone can be properly ventilated, there is no earthly reason why those conveying, in addition, other drainage cannot be also constructed so as to allow of the escape of gases and effluvia in the proper places. But the truth of the matter is, that if the drains are properly trapped and properly constructed upon a scientific as well as practical design, there is not the least fear of bad ventilation, silting up the bottom, or choking, or any other of the thousand and one difficulties that the enemies of the system are pleased to invent.

## THE HEATON STEEL PROCESS.

IT is exceedingly interesting to note the anxiety with which the process for the improvement in the manufacture of steel John Heaton, of the Langley Mill, in the Erewash Valley, is regarded not only by the vast iron industry of this country, but also by that of the Continent. In the commencement of the present year, a French commission of inquiry, headed, with the sanction of the French Government, by M. Gruner, Inspector-General of Mines in France, and Professor of Metallurgy in the Imperial School of Mines, spent four days at Langley Mill, and after having witnessed the conversion of their own impure pig iron into excellent steel, and verified the cost of production, decided in favour of the adoption of the process. This event is unquestionably one of the most important and honourable testimonials which have yet been adduced to the efficiency of Mr. Heaton's system of conversion. The vast industrial and commercial interests involved necessarily invest the solution of this metallurgical problem with an importance which raises it above the personal differences of rival patentees, however eminent and entitled to respect; and the great question at issue has arrived at a stage when the British public look for practical action in this matter. In the MECHANICS' MAGAZINE of October 30 last year, we published a succinct account of the process, and engravings of the plant at Langley Mill. For the purpose of keeping our readers au courant of the present position and progress of this invention, we propose to furnish a condensed summary of the correspondence which has recently attracted so much attention, regard being had to the principal issues raised by Mr. Heaton and Mr. Bessemer respectively, in the two letters of these gentlemen, published in the "Times," that of Mr. Bessemer, of the date of December 19, and that of Mr. Heaton, in reply, dated December 31. The text of the reet drainle the rebelonging to the double plan. It is, in fact,
annels, and
That irrimight be regarded in the light of a kind of

we shall best serve the interests of the public by presenting the substantial points of these letters in a condensed form. Besides, several collateral issues have been raised in the course of this correspondence which have but a very partial bearing upon the great question at issue, so that it is desirable to disencumber the subject of much that has been advanced.

Mr. Bessemer, in his letter which appeared in the "Times" on the 19th of December last, distinctly denies that Mr. Heaton can make steel as good as his, and at a less cost, from the same materials, with a plant costing vastly less, because Mr. Heaton employs 28s. worth of nitrate per ton, in lieu of using atmospheric air; nor does this extra expenditure produce "cast steel," and, therefore, the further cost incidental to a second melting must be added. He further states that 10 per cent. on the cost of the Bessemer apparatus does not amount to more than 2s. per ton on the steel made by it, which shows a loss on the nitrate process. Mr. Bessemer frankly admits that he cannot make good steel from inferior brands rich in sulphur and phosphorus, as Cleveland and Northamptonshire pig; but he says the iron he is buying of the highest quality, at 65s. to 70s. per ton, costs less for the ton of steel produced than the low class of pig irons named, when the 28s. worth of nitrate is added, making the materials of a ton of Heaton crude steel cost more than the materials used in the Bessemer process, whilst the latter yields cast steel, to obtain which Mr. Heaton must re-melt at much cost. Mr. Bessemer also denies that Mr. Heaton can make good steel and from as cheap from the commonest pig as he—Bessemer—can from the most expensive brands, which is but a corollary of the previous proposition, if demonstrated. Mr. Bessemer states that the loss by his process is 121 per cent.; whereas by the Heaton process the waste or loss cannot possibly be less.

In reference to the validity of Mr. Heaton's patents, Mr. Bessemer avers that the use of nitrate is not new or exclusive, and, further, that inasmuch as the effect produced by it is due to the streams of oxygen generated by its decomposition, and which are analogous to the streams of oxygen contained in his blast, Mr. Heaton's process would be such an infringement of his, if he produced fluid cast steel, that he might have opposed Mr. Heaton's disclaimer, and that Mr. Heaton owes the present validity of his patents to this magnanimity. Mr. Bessemer mainthis magnanimity. Mr. Bessemer maintains that one of the conditions of his own claim is the retention of the malleable iron or steel in a fluid state, and the pouring of it while still fluid into ingot moulds; and that upon this point of fluidity hangs the whole question of infringement by Mr. Heaton

of his (Mr. Bessemer's) patent.

Such are the leading points of Mr. Bessemer's letter of the 19th of December. On the 5th of the present month, the "Times" published certain extracts from Mr. Heaton's letter of December 31, in reply to the foregoing, as containing the "material parts." A remonstrance from the solicitor of the patentee, however, appeared in the "Times" of the

that the first product of his process is crude steel, but he denies that Mr. Bessemer has any right to question his capability of turning out, by means of a furnace, ingots suitable for making rails, because such was not certified thereto by Dr. Miller, who reported on the process. All that Dr. Miller was invited to testify was the capability of the process to make of certain attested pig—1st, true steel; 2nd, crucible tool steel; and, 3rd, wrought iron. Mr. Heaton proceeds with the following, which was published in the "Times":-

Mr. Bessemer flatly contradicts my statement that I can make steel as good as his own, and at a less cost, from the same materials. I am contented to appeal to facts, and these will shortly come before the world, verified by a competent and disinterested authority. An impartial French commission, headed, with the sanction of the French Government, by M. Gruner, Inspector-General of Mines in France, and Professor of Metallurgy in the Imperial School of Mines, have, as I led you to expect, just spent four days at Langley Mill, and after having witnessed the conversion of their own impure pigiron into excellent steel, and verified the cost of production, have taken away with them evidence which must carry conviction to all who are interested in establishing the truth. Now, I do not feel called Mr. Bessemer flatly contradicts my statement that must carry conviction to an who are interested in establishing the truth. Now, I do not feel called upon publicly to divulge my cost sheet—open however, as it is to inspection for legitimate purposes—simply because Mr. Bessemer chooses to insinuate, without warrant, that I cannot turn out "steel rails" by my process at less cost than "Bessemer rails," in the face of my assertion that I am turning out steel rails without remelting the product of my converter, at a cost with which no Bessemer steel can compete.

Mr. Heaton continues, and draws attention to the statement of Mr. Bessemer, that his first-class pig does not cost more than from 65s. to 70s. per ton, and yet the market price of his rails are £12 per ton. There must, consequently, be a large margin of profit left. But he denies that such pig can be bought for 70s. a-ton. The highest class Workington pig was at 80s., on December 19. But, assuming that Mr. Bessemer's quotation were the current price, the cost of the cheap atmospheric air, which is, at the very least, 5s. plus the extra cost of the requisite after dose of swiendleign (no loss than 8s.) being Mr. of spiegelcisen (no less than 8s.), brings Mr. Bessemer's raw material to 83s., or 93s. per ton if the current quotation be taken, while the cost of low-class pig, say 42s. plus 24s. for the nitrate, brings the Heaton raw material to but 66s. As to the waste by the Bessemer process -which Mr. Bessemer affirmed, in his letter, was only 121 per cent.—Mr. Heaton states, on the evidence of several of Mr. Bessemer's licensees, that 171 per cent. is the

minimum waste to which they have attained.
Mr. Heaton alleges that Mr. Bessemer exaggerates the cost of the nitrate and the quantity employed. "With less than 1½cwt. perton," writes Mr. Heaton, "I have produced per ton," writes Mr. Heaton, "I have produced excellent steel this week, in the presence, and to the entire satisfaction of M. Gruner, Baron G. d'Adelsward, and M. Thieblemont, the able representative of M. de Wendel, from white forge pig, produced at Baron d'Adelsward's works, at Longwy, in the department of the Moselle, from collitio ore, similar in composition to that of Northampers and the state of th similar in composition to that of Northamp-

what is taking place at his own. I will not then what is taking place at his own. I will not, therefore, accuse him of wilful concealment of facts, but, in corroboration of my former statement, I am prepared to bring forward evidence, upon oath, that a twelve-hole crucible furnace has been in use for seven years and upwards in Mr. Bessemer's own works, in Carlisle-steet East, at Sheffield, and that it has been there the common practice to run the steel out of his converter into a large cistern of water, from which the granulated metal is collected, and re-melted in-crucibles for the production of tool steel.

Mr. Heaton next proceeds to complain that Mr. Bessemer, professing to pronounce ex cathedra a condemnation of the Heaton process, has never taken the slightest notice of the tests of the metal manufactured, as certified by Mr. Kirkaldy, who has reported that steel made from pure Clay Lane No. 4 forge pig, bore 53 tons to the square inch, and that Butterley bore 45 tons, while the wrought irons from these brands bore 25 and 24 tons respectively. Since the date of these reports, Mr. Kirkaldy tested the steel made under the eyes of the French Commission, from the impure oolitic French pig, up to a breaking strain of 55 tons to the square inch. Mr. Heaton then proceeds to enter into a purely personal question, which, nevertheless, may be readily excused, since Mr. Bessemer had opened the matter. Mr. Heaton says:—

Feeling it to be necessary to account to the public for his taking out three patents for the use of nitrates, Mr. Bessemer professes to state his real motive for so doing. The motive suggested by the latter half of his letter is that he had been desirous only of or instetter is that he had been desirous only of protecting himself against infringements by me of his atmospheric patents, and he leads the reader to infer that this desire arose after the abortive issue of certain negociations with him, initiated by ma. I ask, in simple justice, to be allowed to refute both statement and inference. To prevent the public being misled, it will suffice to state the fact that Mr. being misled, it will suffice to state the fact that Mr. Bessemer's first patent for nitrate was taken out in December, 1867, whereas I never saw Mr. Bessemer till March, 1868. Mr. Bessemer's statement is, that early this year (1868), one of the proprietors of Heaton's patents endeavoured to persuade him to take an interest in them on favourable terms, and that he declined to do so. I most unequivocally contradict this statement. At the beginning of this year my patents were exclusively in my own handa, and I had no idea of disposing of them either to my present partners or to any other person, though I had been frequently solicited to do so. My visit to Mr. Bessemer in London, on March 3, was paid from no wish of mine to negociate with him, but in con-Mr. Bessemer in London, on March 3, was paid from no wish of mino to negociate with him, but in consequence of an intimation conveyed to me that he wished to see me; and neither on that nor on any other occasion did I, nor any person authorized by me, or by my sole partner at that time, or by my partners since, "endeavour to persuade Mr. Bessemer to become interested in my patents upon favourable conditions," or upon any conditions whatsoever.

The "Times" supplies the next paragraph, which brings us to the end of the letter. "After such evidence as this," writes Mr. Heaton,

It matters nothing what the product of my process is called by Mr. Bessemer, and I do not need Mr. Bessemer's unsolicited approval of what he has never seen, while I am able to produce, as I have already told him, a perfectly homogeneous steel, and cheaper than he can make, even if he could make it from such brands as I employ. I am not aware that it is necessary, in all steel making, for all time to come, that it should resemble Bessemer's in its successive stages generally when the all time to results are supprised. as containing the "material parts." A remonstrance from the solicitor of the patentee, however, appeared in the "Times" of the following day, pressing the consideration that, as the entire letter of Mr. Bessemer, containing some singular statements, was published, it was incumbent upon the same journal to publish a full reply. There can be no question that it was a grave mistake to insert Mr. Bessemer's diffuse letter, and we have before us a copy of Mr. Heaton's reply in extense, and we would willingly limit ourselves to the extracts published in the "Times," but the charges made by Mr. Bessemer, which will be fully understood by the reply, are serious, and we shall proceed to supplement the published extracts by an accompanying summary of the portions of the letter which were comitted. Mr. Heaton's letter is menting gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is menting gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling gives tool steel, and tool steel is to which were omitted. Mr. Heaton's letter is milling to milling the melting process in particular t compared with Dr. Miller's determination of the phosphorus in the pig iron I use, and in the steel I produce, the advantages of my process will be at produce, the advantages of my process will be at produce, the advantages of the opinion of Mr. Bessemer, one apparent; and when, therefore, Mr. Bessemer, one apparent; and when, therefore, Mr. Grove, with the full knowledge of the opinion of Mr. Grove, his own counsel, that the employment of nitrate of hos own counsel, that the employment of nitrate of sold in the starting of iron sold in the starting of iron and steel, could not be construed into any infringement whatever of his patent, hints at possible appliment whatever of his patent, hints at possible appliment whatever of his patent, hints at possible appliment where the startling general proposition that "malleable iron or steel," when in a fluid state, cannot be poured into moulds without a fluid state, cannot be poured into moulds without its lisonee, his application for an injunction would fail.

I claim what I affirm and have found to be the compared with Dr. Miller's determination of the

a fluid state, cannot be poured into Mounta and a fluid state, cannot be poured into Mounta and a fluid state, cannot be poured into Mounta and a fluid state, cannot be poured into Mounta and the sistence, his application for an injunction would fail.

I claim what I affirm and have found to be the mission of the mission of the mission of the sake of commercial success. Conceding, for the sake of commercial success. Conceding, for the sake of nitrate of soda were common property, or, use of nitrate of soda were common property, or, use of nitrate of soda were common property, or, use of nitrate of soda were common property, or, use of nitrate of soda were common property, or, use of nitrate of soda were common property, or, use of nitrate as successary for the secretained patent. It was evidently supplied to which is necessary for the useful application of the nitrate process is of the essence of application of the nitrate process is of the essence of application of the nitrate process is of the essence of application of the nitrate process of the essence of application of the nitrate process is of the essence of application of the nitrate process is of the essence of application of the nitrate process is of the essence of application of the nitrate process is of the essence of application of the nitrate process might to Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer has appreciated its to show how much Mr. Bessemer declares elements of my invention. Mr. B I claim what I affirm and have found to be the

Mr. Bessemer, well knowing that the fact of my success, which he still affects to dispute, has not, as he says, been before the public for twelve months, but says, been before the public for twelve months, but says, been before the public for twelve months, but says, been publicly notified in your city article of October 26, been publicly notified in your city article of October 26, been publicly notified in your city article of October 26, it is masters "have not rushed in a body to take iron masters "have not rushed in a body to take iron masters before its success was known. He conlicences "before its success was known. Important him to induce them to adopt his own. Important him to

disapproves.

Mr. Bessemer, having gratuitously provoked a discussion intended to damage my patent, retires from the controversy. In felicitating him upon the cossation of his duties as public monitor, I will but cossation of his duties as public monitor, I will but sak him what would have been his opinion of a fellow labourer in the same field, who, during the five low labourer in the same field, who, during the five low labourer in the same field, who, during the five ondeavouring in vain to convince the iron world of endeavouring in vain to convince the iron world of the value of his invention, had taken similar steps to prejudice him which he has adopted towards me to prejudice him which he has adopted towards me. He admits his inability to deal with my materials. I assert my perfect competency to do so, and thereby to "add at least ten millions a-year to the wealth of the country." the country.

The annual circulars of the iron trade which were issued at the beginning of the which attaches to this process. Messrs. Bird, Messrs. Rogers, Messrs. Shaw and Thompson, Mesers. Griffiths, and other well-known firms, are unanimous in expressing their belief that before long rails of a highly durable character, perore long rails of a nignly durable character, equal to Bessemer rails, will be produced at a more moderate price. Judging from the eminently satisfactory results which have attended the working of the Heaton process, attended the working of the Heaton process, and looking at its bearing upon the manufacture of iron and steel, we have no hesitation in pronouncing it to be one of the most valuable and important inventions of the day, and one for which it is not difficult to predict highly successful future.

TELEGRAPHIC PROSPECTS.

THE present year commences far more favourably for telegraphy than did the last, and, indeed, it may with safety be said that there is more hope of telegraphic extension now than there has been for some years. Our last numbers have presented to our readers a retrospect of telegraphic progress during the retrospect of telegraphic progress during the past year; it will be now our object to throw some light upon the works which will be completed during the present year, and upon those that will most probably be undertaken.

By the middle of the year, the transfer of our network of internal telegraphy will have taken place: the enormous amount of wires

taken place; the enormous amount of wires, instruments, and matériel belonging to the various telegraph companies, will have passed from their hands to the Postmaster-General, for the carrying out from that time the telegraphic services of the country by the ad-ministration of the Post Office. Many view the change with gloomy ideas of the State control, but we cannot share those ideas, but, on the contrary, look forward to an improved telegraphic service as the result of the change telegraphic service as the result of the change from a series of opposing companies to the uniting of the whole under one system. A general reduction of tariff, from a necessarily decreased amount of expenditure, may be regarded as an early consequence of the transfer, bringing about a large increase of transfer, bringing about a large increase of business, for telegraphy will then be accessible to many to whom hitherto it could only be used as a luxury, or in cases of imminent need.
That the service itself will not decrease in efficiency may safely be stated, for with the change the same efficient staff will be transferred. ferred. Extensions will be made to places hitherto unsupplied with telegraph wires. and we may congratulate telegraphists generally upon there being a greater prospect of work than there has been for some time.

At about the same date as the transfer of our telegraphic system will take place, the "Great Eastern" will have completed her freight of submarine cable, and will be starting from our shores to submerge the new cable from France to the United States. The works connected with this cable are progressing in the most satisfactory nanner; nearly 1,000 miles of the deep sea cable have been completed, a portion of which has been coiled on board a special vessel for carrying to the "Great Eastern"; the coiling on board will immediately commence and be continued uninterruptedly; the shallow water cable has interruptedly; the shallow water cable has been commenced and satisfactory progress made. The cable itself is of the most superior construction, and the conductivity of the connect conductor and insulating properties of copper conductor and insulating properties of copper conductor and insulating properties of the gutta-percha leave nothing to be desired, beyond the hope that the expedition will be successful, so as to allow of their excellent qualities being fairly tested in extensive communication between Europe and America.

munication between Europe and America.

A cable has just left us for Australia, intended to unite two of our colonies, Australia to Tasmania; it is about 200 miles in length, and we may probably hear by the initial middle of the year of the completion of this extension—a wise and useful enterprise of the Tasmanian Government.

On the return of warm weather, the completion of the cable, uniting Denmark to Russia may be looked forward to; a portion—that from Denmark to Bornholm—has already that from Denmark to Bornholm—stoppage of been completed. The sudden stoppage of navigation in the Baltic through the ice navigation in the Baltic, through the ice setting in, has delayed until spring the completion of the remainder, from Bornholm to Liban, the cable for which was carried out in the same ship. We shall then possess an almost uninterrupted line of submarine cable from our shores to Russia. It is also anticipated that a submarine cable will be laid

raising of the end off Havana, and joining the cable to the shore by means of the extra

cable lately sent out.

Very shortly, the "Tweed" and "Calcutta" will leave with 500 miles of cable for the Persian Gulf. Interruptions have occurred in this line chiefly at the same spots; alternain this line chieff at the same spous, and the tive land lines have been erected, where possible, to reduce the chance of total interpretation. But to make the chance still less, this length of cable is being sent out so as to duplicate the communication where these

interruptions are the most frequent. Communication with India has been frequently written about, as being very imperfect; steps have been, as far as possible, taken rect; steps nave peen, as far as possible, taken to improve the communication, of which the sending out this long length of cable is a proof, but still further and independent steps are being taken to increase the efficiency of are being taken to increase the efficiency of our telegraphic correspondence. The works of the Indo-European Telegraph Company are being rapidly pushed forward, and sufficient progress has already been made to satisfy us of the contractors carrying out their agreement for erecting a two-wire overland telegraph from Nordeney in the North Sea

to Teheran.

The preceding are works in progress, and of which there is every prospect of completion during the year; but there are several schemes which it may be safe to report will see brought out in the course of the year. Amongst the foremost of these is another advance towards improving our communication with the East, namely, an extension of the system completed last year by the Anglothe system Telegraph Company, to India.

This will be by a submaring apple from Succession of the Success This will be by a submarine cable from Suez, down the Red Sea, to Aden, and from thence down the Red Sea, to Aden, and from dience to Bombay. Confidence in submarine cables—especially deep sea—is now very great, and as the contemplated route is one of deep and as the contemplated route is one. water, there being every prospect of success, the bringing out of such a scheme to improve tne bringing out of such a scheme to improve our East Indian correspondence will be cer-tain to be taken up with confidence. The completion of such a line would give us then an almost uninterrupted line to India. The extension of telegraphy from Cuba to Jamaica, and from thence to Panama, is a project, it is hoped, which will be brought forward during hoped, which will be brought forward during the year, and other equally good and feasible schemes we hope will be placed before the public, creating such an amount of work that public, creating such an amount of work that we should be glad to see all our submarine cable factories fully employed. Our extentension on land will doubtless progress in the ratio of the increased demand for telegraphic correspondence and it is with great home of correspondence, and it is with great hope of good and useful extension, carried out with unvarying success, that we strive to penetrate

into the future of telegraphy.

As we have, during the past year, kept our readers early and accurately informed of telegraphic and electrical progress, making this subject a special feature of our journal, so, during the present year, encouraged by the success our endeavours have met with, we shall continue to supply our readers with the earliest information upon a branch of engineering which is daily increasing in interest and importance.

NOTES ON RECENT SCIENTIFIC DISCOVERIES AND THEIR PRACTICAL AP-PLICATIONS.

EW MODE OF REFINING AND TOUGHENING GOLD INSTRUMENTS FOR REGISTERING AND MEASURING THE TIME OCCUPIED IN THE PERCEPTION AND ACKNOWLEDGMENT OF IMPRESSIONS ON THE SENSES.

NEW mode of refining and toughening gold has been introduced by Mr. F. B. Miller, of the Sydney Mint. Australian gold often contains The submarine cable from Key West, Florida, to Havana, the only unsuccessful work of last year, will, it is to be hoped, in a work of last year, will, it is to be hoped, in a very few weeks, become a success, by the a small amount of antimony, which renders it

mode of refining it was found did not remove the cause of the brittleness; and the refiners were somewhat puzzled, until the late Mr. R. Warrington discovered that in melting the gold with oxide of copper, the copper was reduced, and the antimony was removed in the form of oxide. In this way, however, the gold is alloyed with copper, which requires to be removed by another operation. Corrosive sublimate has also been employed to remove antimony from gold. In this process, the antimony is converted into a volatile chloride, and driven off along with the subchloride of mercury formed. This process, however, is an expensive one from the loss of mercury. As an improvement on both these modes of refining gold alloyed with silver and baser metals, Mr. Miller has adopted the use of chorine gas alone in the following way:—He first faturates a clay pot with a solution of borax, to prevent any absorption and loss of chloride of silver. Having placed the gold in the pot, it is covered with a closely fitting but unluted lid, having a hole bored in it. Through this, when the gold is melted, he passes a clay pipe down to the bottom of the pot. The clay pipe is in connection with a chlorine generator, and, by a suitable arrangement, a stream of the gas is driven through the metal; after continuing this for an hour or so, the crucible is allowed to cool, for the gold to set, and the chlorides which still remain liquid are poured A small amount of gold is removed with the chlorides, but this is easily recovered. The plan of reducing the chlorides of silver, adopted by the The plan author, was to set the slab of chloride between two plates of wrought iron, and immerse the whole in dilute sulphuric acid, leaving it there for about twenty-four hours, in which time the reduction was usually complete. The reduced silver is then dissolved in nitric acid, when any gold present is left undissolved. The loss of gold in these operations is said to be smaller than in the ordinary process of refining; the refinage is also completed in a shorter time, and is likely, we should think, to be as cheap as the old plan. Remembering, too, be as cheap as the old plan. Remembering, too, the complaints continually made of the nuisance of refining houses to neighbours from the acid vapours off, we may add that Mr. Miller's process can be made quite free frem objection on that score, by intercepting the excess of chlorine in a small chamber, furnished with a trickling stream of milk of lime.

"Quick as thought" has hitherto been used as a figurative expression, to denote an almost in-conceivably short duration of time. Few of those who make use of the expression would think it likely that the minute fraction of a second occupied in the perception of an impression by the senses, and the acknowledgment of it by the will, could be shown as accurately as our chronometers are made to follow the motion of the sun. But this it really accomplished by an instrument contrived by Professor Donders, the eminent oculist and physicist, of Utrecht. He has contrived two instruments, in fact, one of which he calls the Noëmatachrôgraph, or thought-time writer; and the other the Noëmatachromètre, or thought-time measurer. former, as we have said above, only registers the time occupied by the perception of an impression and the acknowledgment of it. A drum driven by clockwork is covered with lamp-blacked paper, upon which a point fixed to one branch of a pitchfork writes a series of waves, corresponding, of course, to the number of vibrations per second of time given by the note of the fork. In this way, it is easy to measure time to the 5-100th of second. By poculiar contrivances, anything which affects the senses, such as a prick to the finger, a spark to be observed by the eye, or a sound to be perceived by the ear, is at the instant made to register itself on the blackened paper. The observer, at the moment he perceives it, by a slight pressure of the finger also makes a mark on the paper, and the number of undulations between the two marks show the time occupied in the operations mentioned above. These operations, in fact, include three separate and distinct acts—the transmission of the impression to the brain, the action of the brain on the will, and the action of the will on the muscles. The same instrument registers as well the time occupied in an act of reasoning. The spark seen may be of different colours. If red it is to be acknowledged by the right hand, if green by the left. Denders finds that to make the distinction and acknowledge it, requires a much longer time than is required for the more simple operation before described. Some error, however, we think, is involved, for it is cer-

tain that one arm obeys the will much more quickly than the other, according as they are exercised. The thought-time measurer is a different sort of instrument. A falling weight strikes a drum and gives a sound, and produces a spark almost at the same instant of time, but with an interval accurately measurable. Thus, two sensations reach the brain almost at the same moment, and the problem to be resolved is which was produced first, the spark or the sound. instrument is so contrived that the anteriority of the sound or the spark can be varied at the will of the operator. The object of the instrument is to determine the space of time which must elapse between the emission of the spark or sound for the mind to be able to decide which was first, and thus arrive at the time required for a simple thoughtthe thought of anteriority. We often talk of slow men and quick men; for the future, we shall be able to measure exactly how quick or how slow they are in their perceptions and in their movements.

#### AN OPTICAL EXPERIMENT.

MR JOHN C. DOUGLAS, Government Telegraph
Department Madree has Department, Madras, has communicated the following interesting paper to the "Philosophical Magazine":—The following experiment (or return) experiments) furnishes a new means of demon-strating experimentally several laws of vision, particularly such as relate to visual direction; and, suitably modified, may possibly be of some practical value. Prepare a rather thick looking-glass by sprinkling its surface with prepared chalk or other fine powder, shaking off the superfluous powder so that the glass be covered with a thin coating of powder, through which the reflected image of the face may be seen with telerable distinctness.

If the glass so prepared be held fin. to Sin. from the face of the observer, and so that he can see a reflection of his own features, on shutting one eye the powder will no longer appear equally distributed, but will appear arranged in lines radiating from a point of the glass in front of the reflected image of the pupil of the eye used in observing the phenomenon. If (the appearance described above being visible) the observer moves his head with relation to the glass, the centre from which the lines appear to radiate and the whole system of lines move. If, however, the observer move his eyeball in its orbit, the glass and his head being stationary, the centre and system of radiating lines do not appear affected. On regarding the prepared glass with both eyes, he will see two centres, from which radiate two systems of lines, one centre being opposite to the image of the pupil of each eye. The appearance is not so distinctly seen, however, with two eyes as with one; and if one eye be stronger than the other, namely, more effective for purposes of vision when both are open, the system of lines appertaining to the weaker eye is less distinct than that appertaining to the stronger. The superior distinctness of the appear-ance when one eye only is used is due to the fact that the eyes mutually interfere when used together, for it is not necessary to shut one eye, but merely to interpose a sheet of card or other opaque body between it and the mirror. I have never failed to distinguish the radiating appearance in my own case, nor in the many cases in which I have endeavoured to show it to unscientific persons; and I believe, if only one eve be used at first, and the instructions given above be strictly adhered to, the appearance may be readily seen by any person; but as I have heard of an instance in which the phenomenon could not be distinguished, I have thought it necessary to give rather minute instruc-

The phenomenon is so easy of explanation that it is not necessary I should explain it; I will therefore confine myself to pointing out that the lines seen represent the apparent directions of the lines ioining the particles of powder and their images, and it is evident that the centres of the systems of lines are in the perpendiculars to the surface jof the mirror drawn through the centres of visual direction. The apparatus may be modified in accordance with the wants of each observer, the principle upon which its construction is based remaining the same; the glass may be of any attainable thickness; a glass plate may be placed in front of the mirror at various distances from it to carry the powder; engraved lines, dots, &c., may be

employed in lieu of powder; figures or other characters may be written on the mirror or glass plate if required; and the whole instrument may be suitably mounted.

The applications of the instrument described appear numerous; a few are given below:-Experimental proof is afforded of the principal lav linear perspective—as the existence of vanishing points, that they are in a line drawn through the centre of visual direction parallel with the vanish-ing lines, that vision with one eye only can be considered in perspective, &c.; the coincidence of visual direction and the centre of the centre of motion of the eyeball is proved by the immobility of the radiating lines when the eyeball only is moved, and their movement when the head is moved with relation to the mirror; a means is afforded of finding a point on a looking-glass, perpendicular to the surface drawn through which would pass through the centre of visual direction; a principle is afforded on which an instrument may be constructed for measuring the distance between the centres of motion of the eves. The instrument I used for this purpose consisted of a card divided along one edge by lines drawn on both sides of it, and as nearly as possible coincident; this card being held in front of a mirror and viewed obliquely, so that the divisions on the card and on its image might be seen at the same time (the card being held with the divided edge horizontal), two lines on the card were seen to coincide with the images of two lines corresponding to them on the other side of the card; and the distance between the two lines so coinciding with reflected lines being read off on the card, gave the distance between the centres of motion of the eyeballs. This instrument admits of great improvement, and it will be evident that its delicacy may be increased by increasing the proportion the distance between the image and object bears to the distance of the mirror from the eyes. It has been stated that, if no apparent motion could be produced in a distant object by closing one eye after having covered that object by another nearer the eye, the eye so closed must be inoperative when both eyes are used, the greater perfection of the one eye obscuring altogether the effect of the weaker organ. And so far as apparent direction is concerned. the experiment seems conclusive. But this view appears to need modification; for in a case in which both systems of lines were distinctly visible simultaneously, proving both eyes were employed, no apparent motion could be produced by closing the left eye; and although the left system of lines was fainter than the right, and the left eye was undoubtedly weaker than the right, the fact that the system appertaining to the left eve was distinctly visible when both eyes were used simultaneously, proves that in regarding the mirror both eyes were effective. It appears, therefore, that the powdered mirror affords a delicate means of detecting the share each eye has in vision, of exposing their inequalities of strength, and of detecting if both are actually effective when used together-in the last, being more delicate than the apparent-motion test.

Sir David Brewster (Optics, p. 294), has stated that the centre of visual direction coincides with the geometrical centre of the eyeball; but it has been objected to this, that Volkman's experiment visual direction proves that the lines of visual direction cross each other in a point anterior to the geometrical centre, and that calculation will show this is inconsistent with the curvatures and refractive powers of the humours composing the refractive media of the eye; but as, in the powdered-mirror experiment, the grain of the powder seen singly and forming the centre of system of lines marks the point through which a perpendicular to the surface of the mirror represents the line of visual direction, and as this line is immovable when the eyeball is moved, it follows that this line passes through a point the eyeball stationary with regard to the eyeball. wherever the centre of visual direction may be, it is the centre of motion, if not the centre of figure of the eyeball.

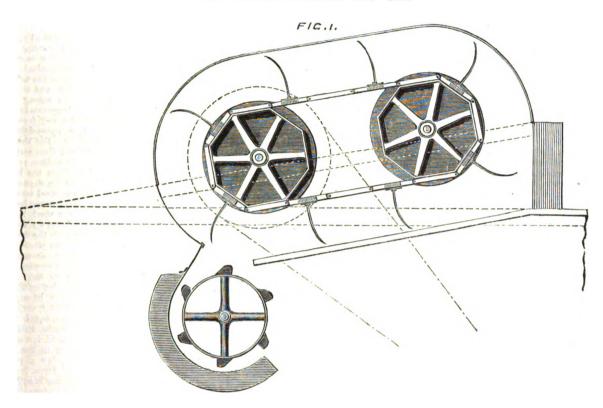
THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending January 9, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 17,204; Mevrick and other galleries, 3,244; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 2,416; Meyrick and other galleries, 305; total—23,162. Average of corresponding week in former years, 10,562. Total from opening of Museum—8,051,092.

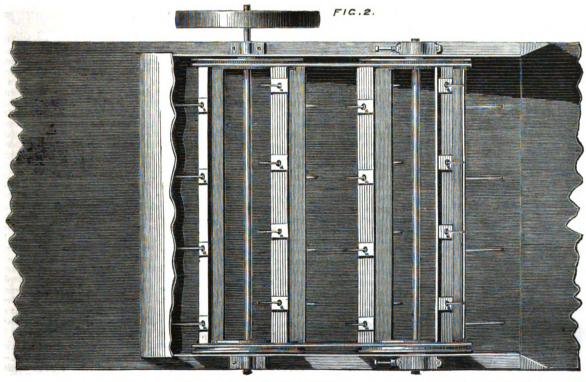


<sup>•</sup> The effect was most striking when the powder was very thinly and uniformly spread over a piece of plain glass placed before the mirror, at such a distance that the powder was rather less than half-an-inch from the reflect-ing surface.

## SELF-FEEDING THRASHING APPARATUS.

BY MESSRS. HAMBLING AND SON.





### HAMBLING'S SELF-FEEDING THRASHING APPARATUS.

THE accompanying engraving represents a self-feeding apparatus for thrashing machines designed and patented by Messrs. Hambling and Son, of East Dereham. Instead of feeding the crop to be thrashed by manual labour to the beating drum of the machine, as is usual, endless chains, driven from any convenient part of the machine, and fitted with teeth or spikes, are arranged to rake the corn forward along a platform to the mouth of the corn forward along a platform to the mouth of the machine. By this arrangement, the crop is

more evenly distributed; there is no loss of corn by escape from the mouth; one man less is required escape from the mouth; one man less is required in feeding the machine; and his labour is considerably reduced, as in a position of comparative ease, he is able with a fork to guide the corn to the feeding teeth, and all liability to choke the apparatus is prevented. If the teeth take the corn at a faster rate than the machine can thrash it, the superfluous quantity will be brought back over the

workpeople so frequently occurring from the exposed situation of the revolving drum in the ordinary thrashing machine. Fig. 1 in our engraving is a vertical section, and fig. 2 a plan of this improved action. These machines have already been he is able with a fork to guide the corn to the feeding teeth, and all liability to choke the apparatus is prevented. If the teeth take the corn at a faster rate than the machine can thrash it, the superfluous quantity will be brought back over the top and taken round a second time. The mechanical arrangement is so simple as not to be likely to get out of order, and the last, but not the least, advantage is the sure protection afforded against those fearful and often fatal injuries to proved action. These machines have already been awarded the first prize of a silver metal, in competition with many others, and the list of testimonials now before us as to their efficiency is such as to justify a belief that the employment of this apparatus will be general, especially as it can be readily applied to any existing construction of machine. We may add that Mr. T. C. Hambling, of 7, Westminster Chambers, Victoria-street, London, is the

#### ON LATENT HEAT. By J. C. DYER, Esq.

THE origin and nature of heat having engaged so large a share of scientific attention of late years, and directly conflicting principles in physics having been assumed, to explain calorific pheno-mena, render it desirable to obtain, if we can, some reliable tests of the several grounds on which the opposing theories are based. On the one side it is affirmed that "heat is a material element pervading the universe." On the other, "that it is, in ing the universe. On the other, "that it is, in fact, a nonentity, and merely the result, or consequent effect, of the exertion or expenditure of moving forces." In purely physical inquiries we must be guided by ascertained facts, rather than by authority, even of the most eminent physicists; wherefore I shall adduce some of the well-known facts bearing upon the points at issue. The materiality of heat cannot be sustained, except upon the admission of Dr. Black's doctrine of latent or specific heat in bodies; on this assumption, then I shall cite some of the cases that go to prove the existence of heat in bodies, beyond what is sensible or thermometric in them; and, therefore, in a neutral or latent state. And, first, I take the results of the carefully conducted experiments of Dr. Fairbairn, showing the relations of heat and water in their different forms of union. The following passage is from his valuable work:—"Useful Information for Engineers," pp. 3—4. "When water attains the temperature of 212deg. Fah. under the atmospheric pressure, it boils and gives off steam, which, when slowly formed, contains about 934-6deg. of latent heat, or heat not indicated by the thermometer; if to this be added the sensible heat of 212deg., we have 1,146-6deg. of heat required to raise, say 1lb. of water into steam, under the atmosphere of 14.7lb. pressure. But at a pressure of 25lb. per inch, the boiling point rises to 240deg., at 50lb. to 281deg., and at 100lb. it is of 3273deg. of temporature." The temperature or of 3274deg, of temporature." The temporature or sensible heat in steam is thus gradually raised by the increasing pressure or density of the steam, and saturated steam, or steam raised in a boiler over water, is found to take up nearly double the quantity of water to form steam of double density or pressure; but the latent heat in steam is directly as the quantity of water converted into steam, whilst the sensible heat in it is only as above stated, viz.:

stated, viz.:—
From 212° at 14·71b., to 240° at 251b., increase 28°

" 240° at 251b., to 281° at 5001b., " 41°

" 281° at 501b., to 827½° at 1001b., " 46½°

The decreasing latent heat in steam is found to be nearly as the increasing sensible heat, or, in other words, the absolute heat is nearly in proportion to the water changing its form of a liquid to an elastic

By the increase of sensible heat, all liquids and solids are gradually expanded, and by the abstrac-tion of such heat they are contracted in bulk; but the degrees of expansion and contraction are different in bodies, as shown in the mercurial and spirit thermometers, the Wedgwood pyrometers, and the different metallic rods used for compensation balances and pendulums. In all such cases, the gradual changes of bulk by the gain and loss of sensible heat, the law governing the changes is quite distinct from that which rules in the cases of sudden changes of water and other liquids into which changes of water and other liquids into steam and again back into the liquid form, and by which changes of constituent forms, absorbtion and liberation of heat takes place, to the extent before shown, beyond what is indicated by the thermometer.

It thus appears quite clear that the entering of heat latent in steam is a consequence of water being converted from its liquid state to that of aqueous vapour, and the reappearance of the same heat, in a sensible state, when the steam is converted into water, is equally the obvious consequence of the change. Such reciprocal changes of the constituent forms of bodies clearly serve to explain the changes of heat into its latent and sensible forms, as before stated. We find, too, all solids show the gradual loss and gain of heat, however high the temperature may be raised, unless the body itself be converted into a liquid or vapour, and then the sudden absorbtion of latent heat in them is found, as in the case of steam from water. Taking the total amount of sensible from water. Taking the total amount of sensible heat in steam of 50lb. pressure (as in common use) at 28ldeg., as above shown, and the latent heat in the same steam, as given in the tables, at 2,670deg., the total absolute heat in such steam will equal 2,951deg. Fah. Now, if the entire heat so contained in steam of 50lb. pressure

were to remain thermometric heat, it would, of wore to remain thermometric near, it would, of course, raise the temperature of the pipes and engine to the same degree, which would soften the metal and destroy the vessels conducting it, to say nothing of the danger of attending or even approaching the engine. I am aware of the allegaproacning the engine. I am aware of the allega-tion that heat, not appearing sensible in steam beyond the boiling point, is "because of the ex-pansion of water into some 1,640 times its liquid bulk when converted into steam." Well, even though we allow this way of accounting for the insensible state of the heat in steam, still the fact remains that the 934 6deg. of heat exists in the steam, for that amount is carried over by it to the condenser, and reappears as sensible heat in the water.

From these facts it would seem that the term "latent heat" is the only matter in question; for the entire amount of heat, say of 934deg., that disappears as sensible heat in the steam reappears sensibly in the condenser. It is quite familiar to all, that by the forming of steam, as in common evaporation, sensible heat is absorbed, and the air cooled, also that when aqueous vapour is condensed heat is given out; so that heat is thus continually changing its form from sensible to latent, and vice versa, by the changes of water into the alternate states of liquid and vapour. The same phenomena, but to a less extent, appears in the freezing and thawing of water, namely, when a pound of ice is melted in warm water, the amount of sensible heat required to convert it into water is about 140deg. Fah. more than appears in the water, viz., the heat to maintain its liquid form is 140deg. in excess of what is contained in the state of ice at the melting point; and when the same pound of water is again converted into ice it gives out the said 140deg, of latent heat from the liquid in the act of freezing. A hundred other cases equally familiar might be adduced to show the disappearance and reappearance of sensible heat in bodies upon their changes of constituent forms, as solid, liquids, and vapours, and in all such cases the increments and decrements of heat, in its sensible and latent states, take place suddenly, just as the bodies undergo those changes, and in strict ac-cordance with known scales of specific heat in them, as published in the tables of such heat.

I may here glance at another aspect of latent heat. We have seen that steam of double density, viz., from 25lb. to 50lb. per inch, is raised by the addition of 41deg. of sensible heat; and, again, from 50lb. to 100lb. pressure by the further absorbtion of 46\frac{1}{2}deg. of sensible heat. These small accessions of heat in its sensible state are accounted for by the survive of these than the sensible state are accounted for by the amount of latent heat in the extra water, as before stated; for, to double the pressure of isolated steam requires some 460deg, of sensible heat. If we look to the 140deg, of latent heat in water over that in ice, it will be seen that in lieu of being expended by the heat thus absorbed in melting the ice, the water is contract d in bulk; for at temperatures from 32deg. to 40deg. ice floats with about one-sixth of its bulk above the surface. The notion, therefore, that heat ceases to be sensible by reason of the expansion of bodies when it becomes latent in them is clearly shown to be a fallacy.

I come now to notice the latent heat that becomes sensible by the union of a solid with a gas.
The latent heat in oxygen and carbon being in excess of that in carbonic acid, by the formation of excess of that in carbonic acid, by the formation of this acid in breathing, the supply of sensible heat is duly maintained to keep up the temperature of warm-blooded animals, and the excess of heat evolved in the lungs is carried off by converting water into steam, which passes out with the breath. If the whole heat so evolved were to breath. If the whole heat so evolved were to remain sensible it would destroy the living func-tions. Many other mutations of heat depending on the vital energies were explained in a former

solids, liquids, vapours, and gases, is also propor tionate to their bulks, in the same form; wherefore, by compressing a body of any kind, sensible heat is given out, and by expanding it sensible heat is re-absorbed, or taken up in a latent state; so that mechanical forces continually acting among bodies around us bring about the alternate conditions of heat so familiar to everyone. therefore, is thus plainly seen why sensible heat in bodies is produced by mechanical forces. But this affords no ground for assuming the generation de novo of any heat by the exertion of any force—either chemical or mechanical.

We have sensible heat from the solar rays, and We have sensible near from the solar rays, and that produced by combustion, and other chemical changes of bodies, but have strong grounds for concluding that all forms of sensible heat produced by mechanical forces are derived from the latent heat, rendered sensible by compression or the abratical of bodies by graph forces. But the alternation of bodies by graph forces. sion of bodies by such forces. But the alternation of sensible and latent heat thus caused by mechanical action is seen in an endless range of com-But the alternation pressions and expansions from the lighting of a match in the air syringe to the showers of sparks issuing from the particles of steel torn off in dry grinding, and ignited by the intense heat from the compressed air between the steel blade and the grindstone. I need not enlarge on the numerous other facts in accordance with the foregoing, but may venture to say that those cited must be directly met by adducing others to show how sensible heat is made to come and go otherwise than by the changes of heat from one to the other of its states of sensible and latent, before the principle of such mutations of heat can be superseded by the new theory. To say that "work is done" when water passes into steam, equal to the heat entering the steam,—and, again, that when the steam is condensed mechanical force is excited equal to the heat reappearing in the water,—are naked assertions, with no shadow of proof to sustain them, for no mechanical force is called into action in forming the steam, nor is any such force exerted by it in returning the water. So that force exerted by it in returning the water. So that force has nothing to do with those changes, except it be the chemical forces, depending on the known relations of heat and water. We all know that there is nothing occult in the laws of dynamics, and that all moving forces can be distinctly mea-sured, and their amount and direction plainly proved, which forbids the admission of any mys-

tery in the science of mechanics.

Now, in the face of these established laws, we find the following announcement by the able expounders before cited of the new philosophy, viz.:

"When the motion of a body is arrested, the
motion of the mass is transferred to a motion of the molecules—or particles composing it—and this motion is heat." And, again, that "mathe-matical formulæ have been deduced from it, and thus a quantity has been found, termed the me-chanical equivalent of heat." That the motion of the mass is transferred to the molecules is an assumption devoid of any foundation in known facts, for we have no means of proving any kind of dynamical action by such intangible, unknown, and suppositious molecules, or ultimate particles of bodies. And to base mathematical formulæ on such visionary forces and motions can hardly comport with the dignity of the exact sciences, or tend to shed any light upon physical truths, which, after all, must be sustained by known facts, rather than by theories, old or new. As these two theories are based on opposite principles, they cannot both be true; and without referring here to any of the other cases (adduced in former papers) that appear to prove the untenable nature of the new theory, I conclude by submitting the above short outlines of the phenomena resting on, and explaining, the doctrine of latent heat.

on the vital energies were explained in a former paper, and may be here passed by, with the remark that this entire class of changes, as in the case of respiration, are effected by chemical forces called into action by vital organisms. The alternate changes of sensible and latent heat depending on the constituent forms of bodies, and upon the chemical forces so called into action, might be shown in a hundred other cases, but the above will suffice to mark the principle on which the mutations of heat depend.

Apart, then, from the chemical relations of heat with other bodies, I proceed to notice some of the cases in which the appearance and disappearance of sensible heat that do depend on the action of mechanical forces; these are of so wide a range that only a few of them can or need be given. It must be kept in view that the latent heat in bodies, besides depending on their constituent forms, as

\* Literary and Philosophical Society.



#### INSTITUTION OF CIVIL ENGINEERS.

A T a meeting of the Institution of Civil Engineers, held January 12, Mr. C. H. Gregory, President, in the chair, the paper read was on coal-getting machinery, as a substitute for the use of gunpowder, by Mr. C. J. Chubb.

It was remarked that the improvements now

needed in the art and practice of coal-mining might be thus specified,—first, to ensure greater safety to the men employed in working, and, secondly, to obtain the coal in better condition, and, by preventing as much as possible the loss arising from waste, to make more fully available all the remaining resources of the coal fields. It was contended that the use of gunpowder and the operation of blasting must be altogether abandoned; and the problem to be solved was, what force could be applied which should be equally effective, and at the same time break the coal in a more perfect manner. The author thought some more simple and practicable means of getting coal by mechanical power could be devised than the costly, but skilfully contrived, coal-cutting machines. His first idea was to apply wedges, acted upon by hydraulic force, but he was induced to abandon that system, owing to objections to the use of wedges, and to adopt instead an apparatus consisting of twelve plungers, set side by aide in a steel bar, which plungers, when acted upon by water from a hydraulic pump, would separate the bar in which they were set from another bar, formed in the shape of a cover upon the plungers. The pressing apparatus was 25in. long and it was attached to a hydraulic pump by a tube 2ft. in length, so that it might be inserted into the coal to a depth of about 3ft. 6in. The apparatus with the cover on, was 4 in. in diameter. When by the action of the pump, the plungers had reached their limit of 2½in., and further expansion was needed, the plungers were readily brought back to their first position, by opening an escape cock for the water, when a liner could be inserted between the plunger and the cover: and this process could of course be repeated. In practice, however, it was found that the first expansion to 2\frac{1}{4}in. was more than sufficient. It was stated that the collective area of the plungers was 24 square inches, and as the pump could exert a pressure of 12 tons on the square inch, a total pressure of 288 tons could be brought to bear on the coal.

This apparatus had been tried in the South Wales district, where the coal was of the most varied description. It was observed that by the present description. It was observed that by the present system of blasting, it occupied, on an average, two men ten hours to break down and fill into trams 4 to 5 tons of coal, of which 20 per cent. was "small," and the remainder much shattered. On the other hand, with this apparatus, two men could readily break down 20 tons in one hour, which could be filled, when loosened, at the rate of 10 tons per man per day, the whole of the coal so obtained consisting of large solid pieces. Again, by the present system, in order to break down 500 tons of coal a-day, from a "four-foot" seam, a "face" of 600 yards was required, whether as "pillar and stall," or as "long work"; whereas, with this apparatus, the same quantity could be worked from 300 yards of "face." In this way there would be considered to the provided of the working 300 yards of "face." In this way there would be less space requiring to be ventilated, the working operations could be concentrated, and facilities would be afforded for effecting economy in other

respects.

The discussion was then resumed on Mr. Bidder's paper in conjunction with Mr. Chubb's, and not being concluded it was then announced that it would be continued at the next meeting, when, time permitting, the following paper would be read: "On New Ferry and New Brighton Piers," by Mr. H. Hooper, Assoc. Inst. C.E.

At the monthly ballot, the following candidates At the monthly ballot, the following candidates were balloted for and duly elected:—As members, Messrs. W. Anderson and F. W. Kitson; as associates, Messrs. C. J. Clarke, E. N. Clifton, T. Dyke, R. M. Green, T. Hennell, A. H. Kessner, F. L. O'Callaghan, W. W. Phipson, L. W. Pritchard, W. Stevens, W. H. Treverton, and M. Vidler. It was also announced that the following candidates had been admitted students of the Institution since the date of the last announcement:—J. Addy, J. Bau-mann, J. Brunlees, A. G. Fowler, A. C. Robson, R. Sharland, G. Stevens, and J. J. Stiles.

THE works at Creusot are constantly presenting some new feature of interest. Recently a new theatre was opened there, capable of containing from 700 to 800 persons, with pit, two galleries, and orchestra stalls, painted in white picked out with gold, and illuminated by means of a transparent ceiling. M. Morisot, of Creusot, was the architect.

SHIPBUILDING ON THE CLYDE IN 1868.

NE last week briefly summarized the shipbuild-W ing of the Tyne for the past year; we now give the results of a year's shipbuilding on the Clyde. From statistics of this trade during 1868, which, together with comparative tables for the six previous years, have just been published, it larger appears that during the year there have been larger appears that during the year there have been launched from the various building-yards on the river between Glasgow and Greenock, 227 vessels, with a gross tonnage of 174,978 tons. Of these the proportion were steamers, there having been launched no fewer than 8 war steamers, of 5,384 tons, 18 paddle steamers, of 6,291 tons, 82 screw steamers, of 81,241 tons, 8 screw hopper barges, of 1,900 tons, and 2 steam dredgers, of 485 tons. Of the above, all were iron vessels but four, registered as composite. Of sailing vessels, there were launched 78 (iron), of 63,799 tons, 16 (composite), of 13,313 tons, 14 (wood), of 2,234 tons. There were also launched 6 yachts of 381 tons. Of the steamers, no fewer than 8 war ships—namely, the were also launched 6 yachts of 331 tons. Of the steamers, no fewer than 8 war ships—namely, the "De Tyger," "De Buffel," powerful turret ironclads, built by Napier and Sons for the Dutch Government; the "Hart," "Midge Pert," and "Growler," composite gunboats, of 464 tons, built for the British Government by four different firms; the "Kwang-Tung" and "Shung-Tung gunboats, of 221 tons, built for the Viceroy of Canton by Messrs. Denny of Dumbarton. Among the merchant steamers launched, were the "Ohio," Canton by Messrs. Denny of Dumbarton. Among the merchant steamers launched, were the "Ohio," "Rhein," "Main," and "Donau," of upwards of 3,000 tons each, constructed for the North German Lloyd's; the "Holsatia," and the "Neva," of similar tonnage, for the Hamburgh and American Company; the "City of Brooklyn," for the Inman line; the "Samaria," for the Cunard line; and other powerful vessels for the great ocean routes. Compared with the statistics of 1867, there is a falling off in those of 1868 of 14 vessels but an infalling off in those of 1868 of 14 vessels, but an increase of tonnage to the amount of 60,000 tons, the number of vessels launched in 1867 having been 241, and the tonnage 114,598. The tonnage launched in 1868 is greater than during any of the previous six years, save 1864, when the amount was greater by 10,000 tons. The orders on hand for 1869 are much heavier than they were at the same date last year, so far as the amount of tonnage is concerned. At the close of 1867 there were 130 vessels, of 115,124 tons. This year the number of vessels is 123, and 129,400 tons. Of this number, three are Seriew armour-clads, of 10,188 tons—namely, the "Audacious," "Invincible," and "Hotspur," building by Napier for the British Government; three are paddle steamers, of 1,914 tons; 57 are screw steamers, of 70,600 tons; 58 are sailing ships, of 46,558 tons; and the remainder small vessels. The above orders do not include those of several of the principal shipbuilders, who decline to give publicity to the extent of their contracts.

#### NEW YORK SOCIETY OF PRACTICAL ENGINEERING.\*

THIS society held a regular fortnightly meeting at Room 24, Cooper Institute Building, New York City, on Tuesday evening, Desember 8, 1868. James A. Whitney, the president, in the chair. The subject for regular discussion was "Modern Improvements in Mining Apparatus," and the paper thereon was read by Mr. Wm. B. Harrison. paper thereon was read by Mr. Wm. B. Harrison. The writer treated at length the progress that had been made in mining operations and accessories, from the calabash used by the primitive savage to wash the golden grains from the river sand, to the costly and powerful stamping mills and carefully constructed amalgamating apparatus of the present day. He also spoke at length of the application of the new, but now comparatively well-known, explosive materials, nitro-glycerine, dynamite, &c. with reference to their use in mining and tunneling; and also embraced in his review sketches of principal pumping devices employed in English and American mines.

An interesting debate on various phases of mining followed the paper. A. W. Hall, Esq., gave a description of methods of mining in the Rocky Mountain mining regions, in which some years ago he had been engaged. The great difficulty in that region had been found in separating the gold from the black sand with which it is intermingled, the sand being heavy—about four times heavier than water. The trouble was, however, readily overcome by the amalgamating process. As formerly carried on with mercury spread in the bottom of the separating machinery, this process required an

" "American Railway Times."

excessive quantity of mercury; but an improved excessive quantity of mercury; but an improved method, which consists in coating copper with mercury so that a very large surface of the latter is presented to the gold particles, this difficulty is completely obviated, the quantity of mercury requisite being comparatively small. Mr. Hall described, in the course of his remarks, an apparatus which he had himself devised some years since, which, although requiring more mercury than the one last above indicated, was found in practice to be very efficient in separating gold from the materials in which it occurs in a finely divided state. This amalgamator is simply an elbow, or receptacle, formed in a conducting syphon, through which the fine materials are carried in suspension in water. The particles of gold are, of course, brought into immediate contact with the mercury, and their amalgamation thus secured.

At the request of the president, a gentleman present explained the system of hydraulic mining so exclusively in use on the Pacific coast. The water from natural reservoirs and mountain streams, often at a great elevation, is conducted by flumes to the neighbourhood or district where it is needed for use. From the flumes it passes into great canvas or duck hose adjusted to convey the water to the precise locality to be mined. By means of a movable hose with a nozzle, the stream is directed against the embankment to be torn down or disintegrated, with a force proportioned to the head of water. The earth brought down by this means passes into the sluices, which are arranged to contain the mercury for amalgamating. As the particles of gold come in contact with the mercury, they unite therewith to form an amalgam, which is removed from the sluices at suitable in-

tervals of time.

Dr. J. V. C. Smith, Ex-Mayor of Boston, gave an interesting sketch of what he had seen while travelling in Asia Minor, and other Eastern countries, expressing the opinion that much mineral wealth might yet be discovered in those ancient but remote regions. He made mention of an unique turbine waterwheel which he saw in operation under the charge of an Arab in one of the gorges of the Anti-Lebanon Mountains, in Palestine. The Arabs stated that wheels of similar character had been used by their ancestors for many ages. Dr. Smith also briefly sketched a personal interview with the celebrated Baron Von Humboldt, in which Humsian Empire, with all its gigantic cost, was maintained in a very great degree by the gold derived from the mines in the Ural Mountains.

A member stated, in brief, that in the treatment of gold containing sulphurets, calcination of the ore is essential, and that in this the employment of superheated stoam is found to be the most advantageous.

Mention was also made in the course of the discussion, that in many silver ores the pulveriza-tion should be effected when the ore is in a dry condition. For this purpose stamp mills are much to be preferred to other forms of pulverizing machinery. One of the best apparatus for such purposes operates on this principle. The ore is crushed and powdered by stamps in a closed chamber; a fan-blast carries the fine particles into another chamber, where they are allowed to settle, the accumulated powder being afterward subjected

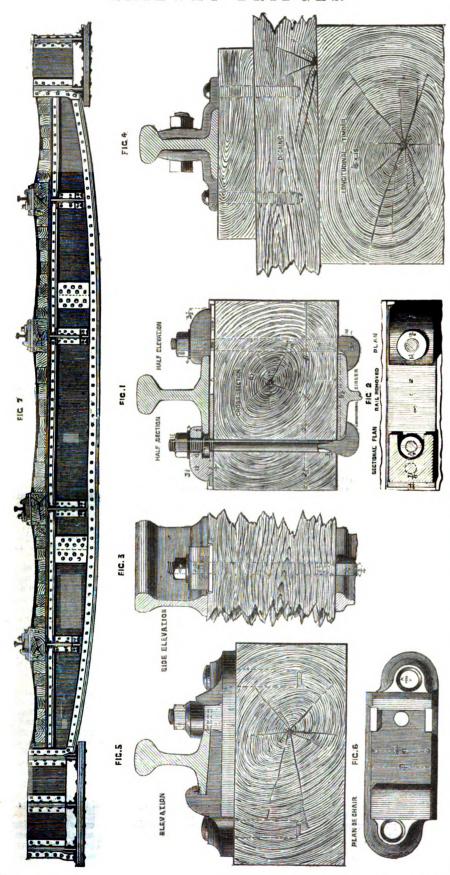
to suitable treatment to extract the silver.

The president remarked concerning the discovery of mines and deposits or the present metals, that their discovery had often resulted from mere accident, a statement which he illu-Carolina deposits, by two children who were playing in a mountain rivulet; of a mine in South America, in which a clambering hunter tore a shrub by the roots from a hillside, which disclosed the precious metal beneath; and of the great mines at Freiburg, in Germany, said to have been first found out by the upturning of the ore by a passing waggon wheel.

After a further discussion on topics relating to the mining of the precious metals, the meeting adjourned for two weeks. The subject at the next meeting will be "The Prevention of Disasters at

On Thursday week the Bywell Ploughing Society held its annual match at Stocksfield, near Newcastleheld its annual match at Stocksfield, near Newcastle-upon-Tyne, when upwards of thirty competitors were in the field. The first and second prizes in the All-England class were awarded to local men using Messrs. Ransomes ploughs. On Saturday last, at Heighington, Durham, not only the first and second All-England prizes, but also the first prize in the district class, were won by local men holding the same make of plough.

# PERMANENT WAY OF THE THAMES RAILWAY BRIDGES.



THE PERMANENT WAY OF THAMES RAILWAY BRIDGES.

W E have crossing the Thames within the metropolitan district, four railway bridges of large span, upon each of which a different system of permanent way has been adopted by the engineers of the several lines to which the bridges relate. It is our purpose to describe these various methods

of accomplishing the same object, and to lay their distinctive features before our readers. Commencing at the higher portion of the river, we will take the fine structure carrying the London, Chatham, and Dover, and the Brighton railways over the Thames at Chelsea, and which is known as the Victoria Railway Bridge. In the arrangement adopted here by Sir Charles Fox and Son, the engineers of the works, the permanent way is carried on longitudinal rolled iron bearers 9in. in

depth, 5½in. in breadth across the top and bottom flanges which are §in. thick, and weighing 35lb. per foot run. The details of the way appear in our engraving at figs. 1, 2, and 3, which show respectively a cross section, a sectional plan, and plan with rail removed, and a side elevation of the arrangement. A longitudinal timber rail bearer, 12in. by 8in., is placed upon the rolled iron girder, and upon this again the rail takes a direct bearing except where the fastenings are interposed. The rail, which is of the flat bottomed or contractor's section, is of steel and weighs 72lb. to the yard. The fastenings occur at intervals of about 3ft., and to receive them the longitudinal timber is cut away to a depth of five-sixteenths of an inch. In this is fitted a wrought-iron distance plate 11½in. long, 3in. wide, and ½in. thick; a slight clearance is left between the plate and the under side of the rail. The object of the distance plate is to make both of the bolts assist in keeping the correct gauge. The rail is held on each side by a cast-iron clip, which also takes into the distance plate. The whole of the parts are held together by two §in. hook bolts, which are inserted from beneath, and clip the top flange of the iron longitudinal bearer. The distance plate is first held down by a bastard nut, 1½in. diameter, the clip is then placed on, and in its turn is held by a 1½in. nut, which completes the system.

The system of permanent way adopted by Mr. Hawkshaw on the Charing Cross railway bridge is shown at fig. 4. The rail is of iron, and of the same pattern as that used on the Victoria Bridge. It weighs 75lb. per yard run, is 5in. deep, and about 4½in. wide in the foot. The roadway is formed with a curved surface, and the rails are therefore placed on longitudinal timber sleepers of varying thickness in order to bring the way up to a true level over all the rail surfaces. The rails are fixed to the longitudinal timbers by wroughtien angle chairs or brackets, placed in pairs at intervals of 2ft. 6in. The brackets are 6in. wide and about ½in. thick in section, and the rails are secured in them by ½in. screwed bolts, passing through holes in the web of the rail. At the joints, fish-plates and lin. bolts are used. The brackets are fixed to the longitudinal sleepers by ¾in. spikes. The longitudinal timbers are spiked down to the decking of the bridge, which is of 4in. timber, and is carried by longitudinal timber bearers 15in. by 15in. On the road bridges of this line, some of which are of very large span, a similar system of permanent way is adopted. The gauge of the line, however, is preserved by transoms of timber 6in. by 6in., which, in the 4ft. 8½in. way, are placed at intervals of about 6ft. In the 6ft. way the transoms are placed at intervals of from 12ft. to 20ft. These transoms are connected to the longitudinal timber by means of 1in. bolts passing through the latter, and of sufficient length to hold them well together.

The Cannon-street bridge, although not the next in succession, may be noticed here, as it belongs to the same company as the last—the South-Eastern. The permanent way on this bridge presents no special features, being simply the ordinary way of the line. This arises from the circumstance that the bridge is laid out for station purposes, and has numerous points and crossings which could not have been so conveniently worked out with the bridge of the ordinary permanent way of the line, which consists of a double-headed rail, fished, and weighing 75lb. per yard, laid at a cant of 1 in 20, the fish-plates are 1ft. 3in. long and 1in. thick, bolted with four 1in. bolts. The chairs are of castiron, and weigh from 28lb. to 30lb. each, the width at seat of rail being 5in., and the base of the chair being 13in. long by 5\frac{1}{2}in. wide. Each chair is sastened to the sleeper with two spikes. To hold the rail in the chair, oak wedges, 8in. long, are used. The sleepers measure 9ft. by 10in. by 5in., and are placed about 2ft. 6in. centre to centre throughout. The sleepers are buried on a few inches thickness of ashes, and thus the permanent way of the bridge is completed.

On the bridge at Blackfriars, carrying the Metropolitan Extension of the London, Chatham, and Dover Railway over the Thames, a different system again has been introduced. Messrs. Joseph Cubitt and F. T. Turner, the engineers of the line, have adopted the arrangement shown in figs. 5 and 6, which represent an elevation of the chair and sleeper and a plan of the chair. The timber longitudinal sleepers measure 14in. by 7in., and are laid directly upon the wrought-iron longitudinal bearers and the cross girders. The chairs are of cast iron and are placed 2ft. 6in. apart. The rails are of steel, and of the flat bottomed pattern, but

slightly smaller in section than those on the Victoria and Charing Cross bridges. The rail is kept in the chair by a lip on the outer side, whilst on the inner it is held down by a wrought-iron on the line rice. Seed when by a put and holt. The on the inner it is held down by a wrought-iron gripping piece, acted upon by a nut and bolt. The head of the bolt, which is tapered similarly to that of a trenail, is flush with the under side of the chair, through which it passes upwards, and thence through the wrought-iron piece to receive the nut. The chair is fastened down to the longitudinal sleeper by two compressed cak trenails 6in. long and 1 3-16in. in diameter. The cant given to the rail is 1 in 20.

The details of the bearers of the permanent way The details of the bearers of the permanent way and the flooring of the Blackfriars railway bridge, are shown at fig. 7, which represents a transverse section of half the bridge, between the outer and the inner main girders, the entire bridge being laid with four lines of way. The engraving shows one of the cross girders, which are placed 4ft. 4in. apart, attached at each end to the main girders its depth at the centre being 1ft. 9in. Immediately beneath the longitudinal timbers are seen the longitudinal wrought-iron rail bearers. The two in beneath the longitudinal timbers are seen the longitudinal wrought-iron rail bearers. The two in the centre are each 1ft. 6in. in depth, whilst each of the two outer bearers are but 1ft. 3in. in depth. The flooring consists of balks of timber laid longitudinally with the bridge, and stapping down him tudinally with the bridge, and stapping down in. each from the side to the centre of each way. The stepped or curved surface produced by this arrangestepped or curved surface produced by this arrange-ment is filled in with asphalte, which forms the top surface of the road. The foregoing oxamples of bridge permanent way show how opinions may vary as to the best method of accomplishing one and the same object, and although in some the end is attained by slightly better means than in others, there is yet great merit in all.

# THE NEW ELEVEN-INCH GUNS FOR

THE NEW ELEVEN-INCH GUNS FOR RUSSIA.

A BOUT five years ago, when the Russian artillery for made use of muzzle-loading rifled cannon, the Russian Government had ordered of M. Krupp a time cast-steel gun on that system rifled 11-inch bore, English measure. Since then, numerous experiments having been considered to prove the superiority of breech-loading guns throwing projectiles larger than the bore, the Russian artillery projectiles larger than the bore, the Russian artillery has decided on adopting these guns exclusively. At the time of this decision the 11-inch was in a forward state of manufacture as a muzzle-loader, the state of the state of the gun would be too thin for the slot for the breech-piece; but further experiments on the resistance of breeches of different thicknesses having demonstrated the possibility, the alteration to a breech-loader on Krupp's principle was made. This gun has been subjected to a prolonged trial of 400 rounds, the number fixed by the Russian authorities. The subjected to a prolonged trial of 400 rounds, the follow. 3gr. 3lb. The weight of gun, 25 tons, 11cwt. 3gr. 3lb. The weight of the projectile was prismatic powder. The initial velocity ecommunicated by this charge to this projectile was the subject of the gun stood the 400 rounds with this charge, and remained in a serviceable condition. The above quantities, as well as those which thaving been reduced from the Prussian denominations.

The breech-piece was Krupp's single-round wedge.

follow, are all in English measure, the equivalents having been reduced from the Prussian denominations.

The breech-piece was Krupp's single-round wedge. Two were furnished for the experiments, one was only used for that purpose; the other an ordinary breech-piece, in this experimental by one of the gas in the chamber, and which will be presented by one and all escape of gas was perfectly prevented by one of the charge of the whole broadwell ring. The explosion of the axis of the bore of rounds. The explosion of the axis of the brace-h-piece. The gun was sponged out after the projectiles there was the slightest appearance of leading in the groeves. The gun was sponged with soapy water, which suffices for the whole briefs the lead coatings of the projectiles there was the slightest appearance of leading in the groeves. The slightest fouling. The fectively removed the slightest fouling. The firing by the passage of the gas did not exceed the slightest fouling. The firing by the passage of the gas did not exceed the slightest fouling. The firing by the passage of the gas did not exceed the slightest fouling. The firing by the passage of the gas did not exceed the slightest fouling the firing by the passage of the gas did not exceed the slightest fouling the firing by the passage of the gas did not exceed the slightest fouling the firing by the passage of the gas did not exceed the slightest fouling the firing by the passage of the gas did not exceed the slightest fouling the firing by the passage of the gas did not exceed the slightest fouling the firing by the passage of

for a breech-loader, and the new breech-loading guns of this calibre about to be supplied from Krupp's works will have the bore longer by 2½ calibres, so that the initial velocity communicated to the 496-pounder shot by a charge of 82½lb. of prismatic powder will be increased to about 1,360ft. per second. The gun was discharged, as we have said, by a vent through the wedge; but there was another vent on the top of the gun, which was closed by a steel screw, and was not used. The objects of the experiments were to ascertain the charge required to give a shot of 550lb. Russian (496lb.English) an initial velocity of at least 1,300ft.; to demonstrate by a trial of endurance that, with the charge thus arrived at, a Krupp 11-inch breech loader will stand a greater number of rounds than is required to render it fit for active military service. The trial took place in the presence and under the direction of Major General Majevski, Colonel Janowski, and Captain Doppelmair, of the Imperial Russian army.

With respect to the powder. experiments in for a breech-loader, and the new breech-loading

is required to render it fit for active military service. The trial took place in the presence and under the direction of Major General Majevski, Colonel Janowski, and Captain Doppelmair, of the Imperial Russian army.

With respect to the powder, experiments in Russia and at Essen had shown that the prismatic powder introduced into Russia some years since was yearly without an excessive strain on the gun, and the Russian Government, therefore, sent to account the Russian Government, therefore, sent to account the render of the factory had also a stock of prismatic powder made by Ritter, of Hamm, in Rhenish Prussia, according to the Russian formula. The cartridge bags were of single cotton stuff, the cartridge forming a regular single cotton stuff, the cartridge forming a regular hexagon, with tiers of 37 prisms; the greatest diameter of the hexagon being 965in, the smallest diameter of the hexagon being 965in, the smallest diameter of the hexagon being 965in, the smallest deak grow, it has a convenience for loading; the recoil was on an inclined plane, so that the gun, after each round, ran back nearly to its original position. It stood in a roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but at roofed place, and the firing was into an earth but a charge in the second was 32-9ft. from the muzzle; the second was 32-9ft. from the first. The target wires were fastened separately

Gun.	Calibre.	Charge.	Shot.	Unitial Velocity.	Vis Viva. Metre Tons.	Vis viva per Centimetre. of Circum- ference. Metre Tons.
Krupp's b.l. 15 tons	in.	lb. 46	lb. 275	ft . 1,340	1060-5	15
Krupp's b.l. 26 tons		82	475	1,353	1975-0	
English m.l. 24 tons		79	600	1,180	1796-7	19

THE ROYAL INSTITUTION.

THE first meeting for the founding of the Royal Institution of which there is any record was held in 1799, at the house of Sir Joseph Banks, and the following letter from Faraday to Mr. Weld, contains all the particulars obtainable respecting its transactions:—

all the particulars obtainable respecting its transactions:—
"Royal Institution, March 20, 1848. My dear "Royal Institution, March 20, 1848. My dear Sir,—According to the earliest document I can find, the first meeting held for the purpose of founding the Institution, was March 9, 1791, at the house of Sir Joseph Banks, in Soho-square. It is called a meeting of the managers, and there were present—Sir Joseph Banks, the Earl of Morton, the Earl Spencer, Count Rumford, Richard Clark, Esq., and Thomas Bernard, Esq. These were the men; and at that meeting, they made Sir Joseph Banks chairman, and Mr. Bernard secretary. The title and purposes of the Institution as given at that time are as follows:—Institution for Diffusing the Knowledge and Facilitating the General Introduction of Useful Mechanical Inventions and Improvements, and for Teaching by Courses of Philosophical Lectures and Experiments, the Application of Science to the Common Purposes of Life. You will see that no idea of the research that grew up in the time of Young and Davy, entered into the conceptions of the founders. The first meeting of the proprietors (now replaced by those we call members), took place on April 20, of the same year. Ever truly yours, M. FARADAY.

[C. R. Weld, Esq."]

the research that grow up in the time of Young and Davy, entered into the conceptions of the founders. The first meeting of the proprietors (now replaced by those we call members), took place on April 20, of the same year. Ever truly yours, M. FARADAY.

C. R. Weld, Esq."

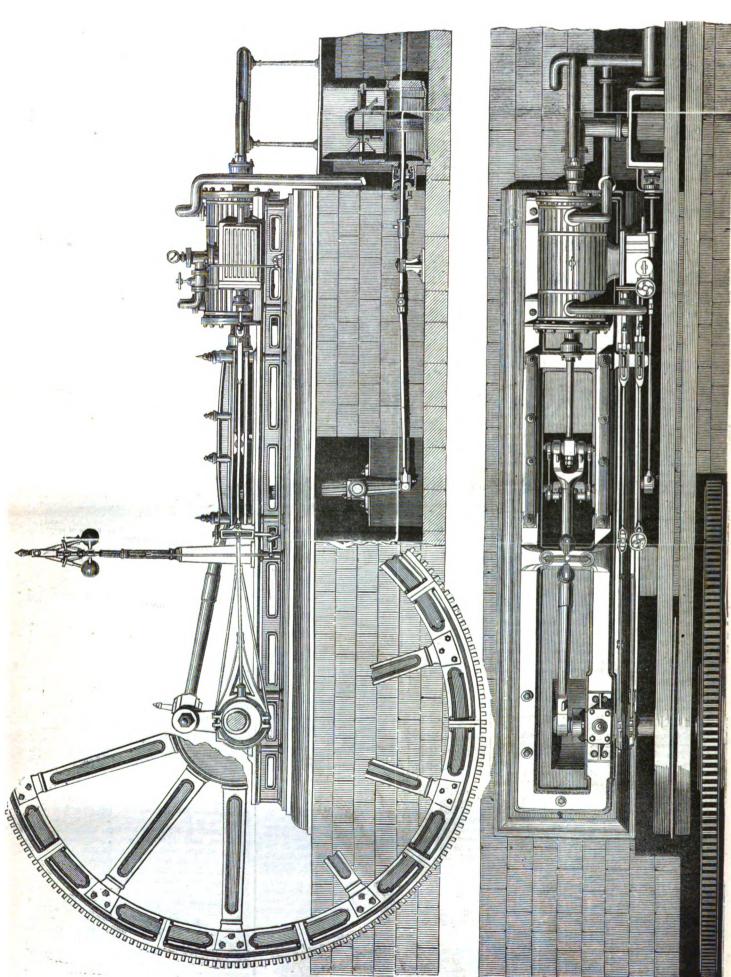
In the first days of the Institution, its supporters were divided into "proprietors, life subscribers, annual subscribers, and ladies," the whole being annual subscribers, and ladies," the whole being amalgamated by a somewhat complex constitution, which gave the "proprietors" hereditary rights, but permitted the shares of the other subscribers to be bought and sold in the open market. The first meeting of the proprietors was held on April 20, 1799; and in the following June, they took possession of some houses in Albemarle-street, to be used for the purposes of the Institution. The rooms were opened, and the lectures began in March, 180°. At the stime, and the lectures began in March, 180°. At the stime, and the lectures began in March, 180°. At the stime, and the lectures are present entertained. The objects of this society were then of a nature very different from those at present entertained. The commercial applications of science occupied the attention of the promoters more than the discovery and elucidation of natural laws. For instance, at march 31, 180°, after several rules had been passed, March 31, 180°, after several rules had been passed, they appointed fourteen committees for the following chees; 4, improving stoves; 5, improvements in making cheap bread; 2, improvements in making making cheap bread; 2, improving morter and emmert; for use in stoves; 11, improving mortar and emmert; 12, how to build houses of different kinds of earth, rammed together; 13, committee of mechanics; 14, rammed together; 13c committee of mechanics; 14, rammed together; 16 can be an authorised of

# STEAM FIRE-ENGINE FOR VALPARAISO.

STEAM FIRE-ENGINE FOR VALPARAISO.

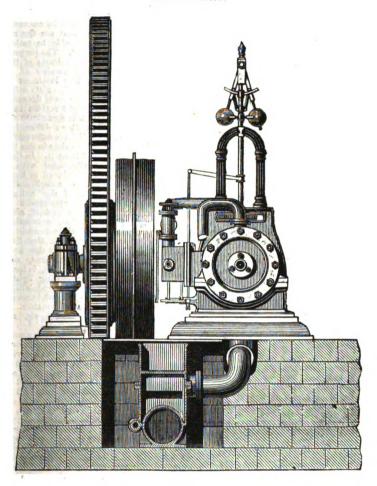
THE steam ship "Panama," which left Liverpool on the 13th inst., has taken out to Valpara so, for the No. 3 Fire Company there, one of Mes rs. Merry weather and Sons' largest size Admiralty pattern double-cylinder steam fire-engine, same as the engine "L'Empereur," one of those for which the firm received the gold medal at the Para Exhibition of 1867. This new engine, named "Cachapoal," is highly finished and deco ated, has a high-toned bell and whistle, and is ar any d to be drawn by the volunteers of the Company af creates the American style; it has two horizontal steats be drawn by the volunteers of the Company af er the American style; it has two horizontal stea t cylinders, each 83in. diameter, and two coubl-acting pumps, each 64in. diameter, with 24in. stroke of pistons, and a suction hose 64in. i.t. rnd diameter. Before leaving London it was not a constroke of pistons, and a section hose 6\(\frac{1}{2}\)in. Let rull diameter. Before leaving London, it was put o a thorough test, which proved highly satisfied ry. Mesers. Morryweather had previously supplied two other but smaller sized stoam fire-angines to the No. 1 and 2 Companies at Valparaiso, which have No. 1 and 2 Companies at Valparaiso, which have proved most efficient in subduing fires, and they now have a fourth steam fire-engine for the city of Santiago, which is within a few miles of Valparaiso, and where our readers may probably Valparaiso, and where our readers may probably recollect some three years ago a cathedral and many persons were destroyed by fire.

. FORTY-HORSE HORIZONTAL  $^{7}_{\rm J}$  CONDENSING ENGINE. BY M. BOYER.



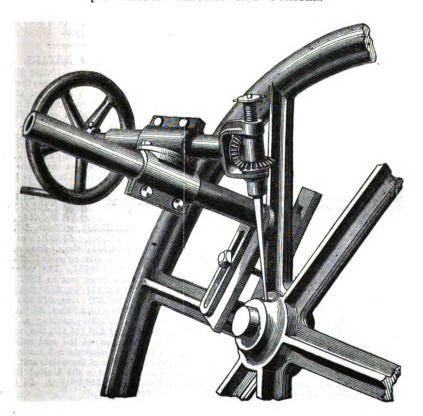
## FORTY-HORSE HORIZONTAL CONDENSING ENGINE.

END ELEVATION.



## PORTABLE DRILLING MACHINE.

BY MESSRS. WESTRAY AND FORSTER.



## HORIZONTAL CONDENSING ENGINE.

HORIZONTAL CONDENSING ENGINE.

THE profizontal engine illustrated herewith is a fine specimen of work which has been turned out from the factory of M. P. Boyer, of Lille. The general design of the engine, which is 40-horse power, horizontal condensing, with independent variable expansion, will be seen from our engravings. The cylinder is 28-29in. diameter, and the stroke 59in. The steam circulates from the boiler round the cylinder jacket, from whence it enters the main steam pipes just above the throttle valve, and is regulated by an independent valve. The piston rod is continued through the hinder end of the cylinder and protected by a sheath. The rod itself, with all the main working parts, are of steel. The flywheel is made in two sections bolted together. The box consists of three discs; in the centre one are recesses for the arms, which are double, and are bolted at each side of the rim, into which they also dovetail, and of the centre boss; the outer are bolted at each side of the rim, into which they also dovetail, and of the centre boss; the outer discs of the boss are then put on with countersunk headed screws, the outer surfaces being turned up bright. The fastening of the arms in the rim is very perfect, the mode of using a double arm taking the rim at each side gives a facility of securing the whole together like a sandwich beam. There are a double row of wood teeth in the ring of the flywheel, the section of which is formed to admit of the easy replacement of ways teeth from admit of the easy replacement of worn teeth from each side of the wheel. At the point where the arms grasp and are let into the segments of the arms grasp and are let into the segments of the rim the mouldings are filled in flush, giving thickness of metal for the open dovetail mortice in which they take. Motion for the air-pump, which is also horizontal, is taken by a beam from the crosshead. The air-pump has four india-rubber valves, and a very perfect vacuum is obtained in working. M. Boyer may be considered the founder of the mechanical arts at Lille, a city which is the Manchester of continental Europe Manchester of continental Europe.

## PORTABLE DRILLING MACHINE.

MESSRS. WESTRAY AND FORSTER, engineers, Barrow-in Furness, have introduced an excellent patent portable drilling machine, which is well worthy the notice of all our mechanical readers. It is a great improvement upon the ratchet brace, inasmuch as it will do four times the amount of work with only the same labour as the brace. It also possesses other advantages over the ratchet brace, as, for instance, drilling at any angle. as shown by our engraving. labour as the brace. It also possesses other advantages over the ratchet brace, as, for instance, drilling at any angle, as shown by our engraving, which represents the apparatus employed in drilling a hole at an angle which the ratchet brace could not get at. This tool is especially adapted for drilling or boring holes in any piece of work too heavy to be moved to an ordinary machine. The apparatus consists of an upright pillar, having a cranked base, and upon which a cast-iron movable bearing is clamped by screw bolts. The cranked base of this tool is shown in our engraving as made fast to the wheel upon which the drill is working. On the upper side of the bearing is a flanged face, upon which a similar flange turns, one face being recessed and the other being made with a projection. The upper bearing is made with a projection crossbar formed with a forked end, and which is free to revolve in the bearing. It can also be moved backwards and forwards in it, and is fixed in position by set screws. In the hollow crossbar is fitted a spindle which has a hardalso be moved backwards and forwards in it, and is fixed in position by set screws. In the hollow crossbar is fitted a spindle, which has a handwheel at one end, whilst at the other is fixed a bevel pinion gearing into a bevel wheel. This bevel wheel drives a spindle similar to an ordinary drilling machine, which slides within it, but by means of a long keyway, and fixed key in the wheel, is made to revolve with it. The drills are fixed in the spindle in the usual way, and the feed motion is imparted by a screw working through the forked end of the crossbar and receiving the end of the drilling spindle. By this arrangement it will be seen that the drill can be fixed so as to drill a hole at any angle and anywhere within range of the machine. It is exceedingly compact, and is self-contained, so that there is no loss of time in looking for the several parts. The whole apparatus weights only 100th, its size heing short aight times that contained, so that there is no loss of time in looking for the several parts. The whole apparatus weighs only 100lb., its size being about eight times that of the one shown in our engraving. This drill will be found specially useful for shipbuilding and marine work purposes. It has been well received by engineers generally, and is in use by many of our leading firms. In fact, it is just one of those useful tools which ought to be found on every bench. bench.

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#### THE LUMINOUS SEA. (Concluded from page 29)

Concluded from page 29)

IN the month of September, 1865, I again visited Herne Bay, and frequently had opportunities of witnessing the luminous appearance of the sea. I caught many of the hemispherical and minute species of Medusa, but not one of the Beroe fulgens. I observed that these luminous animals always retreated from the surface of the water as soon as the moon rose. I found also that exposure to the daylight took away their property of shining, which was viewed by placing them for some time in a dark situation. In that season I had two opportunities of seeing an extended illumination of the sea, produced by the above animal. The first night in which I saw this singular phenomenon was extremely dark. Many of the Medusa hemispherica and the Medusa scintillans had been observed at low water, but on the return of the tide they had suddenly disappeared. On looking towards the sea, I was astonished to perceive a flash of light about six yards broad, extend from the shore for about the distance of a mile and a-half along the surface of the water. The second time when I saw this kind of light proceed from the sea, it did not take the same form, but was diffused over the surface of the waves next to the shore, and was so strong that for a moment I can'll can be a recovered at the result of the surface of the waves next to the shore, and was so strong that distance from to the shore, and was so strong that for a moment I could see my servant standing a short distance from me. He also perceived it, and called out to me at the same instant. On both these occasions the flash was visible for four or five seconds; and although I remained watching for a considerable time, I did not

was visiole for four or nve seconds; and although I remained watching for a considerable time, I did not see it repeated.

The following experiments which I made upon this subject, would lead me to make different conclusions from those of the preceding authors.

1.—A glow-worm was put into a glass of water, in which it lived nearly two hours, and continued to emit light as usual, until it died, when the luminous appearance entirely ceased.

2.—The luminous substance was extracted from the above-mentioned glow-worm, and from others killed in different ways; but it afforded no light.

8.—The sacs, containing the luminous matter, were cut from the bellies of living glow-worms, and shone, uninterruptedly, for several hours in the atmosphere; and after their light became extinct, it was revived by being moistened with water: some of these were put into water in the first instance, in which they continued to shine unremittingly for 48 hours. 48 hours.

48 hours.

4.—The luminous substance of a glow-worm was exposed to a degree of heat which would have been sufficient to inflame phosphorus, without increasing the brilliancy of its light; and further it could not be made to burn by being applied to a red-hot iron, or to the flame of a candle.

5.—A delicate thermometer was introduced among some living glow-worms, during the time they gave out much light; the temperature of the room being 69, the instrument rose to 75, 76, 77, according to circumstances as the warmth was reflected from the hand, or dissipated by the worm crawling over cold substances. The luminous according to circumstances as the warmth was reflected from the hand, or dissipated by the worm crawling over cold substances. The luminous portion of the tail, when very brilliant, appeared to raise the thermometer quicker than the other parts of the body; but it was not invariably the case. When shining strongly, I thought that the luminous rings communicated a sensation of warmth to the hand, but this was probably a deception, as the actual degree of heat was not sufficient for such an effect. It should, however, be mentioned, that in Templar's observations on the glow-worm, he said his feelings deceived him if he did not experience some heat from the shining of the insect.

6.—To satisfy myself how far the evolution of heat during the shining of glow-worms depended upon the life of the animals, I cut off the luminous portion of the tail from several living worms, and found that if the thermometer was applied to them immediately, it was raised by them one or two degrees; but after these parts were dead, although they continue to emit light, they produced no effect whatever upon the instrument.

7.—Some hemisphorical Meduse were put into a reconnection a small quantity of sea water and

7.—Some hemispherical Medusæ were put into a spoon, containing a small quantity of sea water, and held over a burning candle. As soon as the water became heated the Medusæ appeared like illuminated became heated the Medusæ appeared like illuminated wheels, the spots at the margin and centre alone emitting light; in which manner they shone vividly and permanently for about twenty seconds, when they shrunk and died, after which they were no longer luminous.

8.—Some of the same species were put into spirits; a strong and unremitting light was instantly given out, which issued from the central and marginal parts, as in the preceding experiment, and continued until they died.

9.—Some of the sciutillating and homispherical

9.—Some of the scintillating and hemispherical 9.—Some of the scintillating and homispherical species of Medusa, contained in a small glass jar, were introduced into the receiver of an air pump, and the air being exhausted, they shone as usual when shaken. If any difference could be perceived the light was more easily excited, and continued longer in a vacuum.

I wished next to try the influence of electricity on

the luminous property of animals.

10.—A Medusa hemispherica was placed in a small glass dish, containing a quantity of water,

merely sufficient to allow the animal to preserve its merely sufficient to allow the animal to preserve its figure; being insulated, it was electrified, and sparks drawn from it, which had not the slightest effect; the experiment was repeated several times with different individuals, but without exciting the animals to throw out light.

11.—Some hemispherical Meduse were placed in contact with the tree and set are interpreted being

of the animal.

contact with the two ends of an interrupted chain and slight electric shocks passed through them. During the very moment of their receiving the shock no light was visible but immediately afterwards the Medusæ shone like illuminated wheels, which appearance remained for some seconde. Upon the closest inspection with a magnifying glass, no contractile motion could be perceived to accompany the exhibition of the light. The application of electricity in this instance seems to have acted merely as a strong mechanic shock.

The above experiments on the luminous Medusa were made at Herne, with the assistance of George May, Esq., of Stroud House, and in the contact with the two ends of an interrupted chain

The above experiments on the luminous Medusa were made at Herne, with the assistance of George May, Esq., of Stroud House, and in the presence of a large company capable of accurately distinguishing their results. It seems proved by the foregoing experiments, that so far from the luminous substance being of a phosphorescent nature it sometimes shows the strongest and most constant light when evaluad from exagen gas that it is no sometimes shows the strongest and most constant light when excluded from oxygen gas, that it in no circumstances undergoes any process like combustion, but is actually incapable of being inflamed; that the increase of heat, during the shining of the glow-worm, is an accompaniment, and not an effect of the phenomenon, and depends upon the excited state of the insect; and, lastly, that heat and electricity increase the exhibition of light, merely by operating like other stimuli upon the vital properties of the animal.

of the animal.

In confirmation of these opinions, I may quote the high authority of the secretary of this Society, who has found that the light of the glow-worm is not rendered more brilliant in oxygen, or in oxygenated muriatic gas, than in common air; and that it is not sensibly diminished in hydrogen gas.

I may further add that Spallanzani's experiments of diffusing the luminous liquor of the Medusa in water, milk, or other fluids, are in direct contradiction of his own theory, as is also the extinction of the

water, milk, or other fluids, are in direct contradiction of his own theory, as is also the extinction of the light of these mixtures by the application of a high degree of heat. If the light emitted from animals were derived from their food, or the air they respire, as supposed by Carradori, the phenomenon should be increased or diminished, according to the quantity of food or air that the creatures consume; but we do not find this to be the case, for in those but we do not find this to be the case, for in those situations where they are sometimes found to be most luminous, they are deprived, in a great measure, of these assumed sources of their light.

of these assumed sources of their light.

In fact, the luminous exhibitions of living animals are not only independent of all foreign light, but are frequently destroyed by the latter. I have always found the shining of the Meduse to cease upon the rising of the moon or at the approach of day; and when out of the sea I never could excite them to throw out light until they had been kept for some time in the dark; all the luminous insects likewise secrete themselves as much as possible during the day time, and go abroad only at night. I have, it is true, found that the Scopolendra electrica will not shine unless it has been proviously exposed

during the day time, and go abroad only at night. I have, it is true, found that the Scopolondra electrica will not shine unless it has been previously exposed to solar light; but I have observed that it shoue as brilliantly and as frequently, after being kept a short time in a light situation, as when left uncovered the whole day, the circumstance of the Scolopendra requiring exposure previous to its giving out light, is very unaccountable, as the insect, when left to itself, always seeks as much as possible concealment during the day; indeed, it is the opinion of some naturalists that it is killed by the light of the sun.

The opinions of Brugnatelli and Carradori are connected with some general dectrines, respecting the nature of light, which I shall not at present venture to discuss. It appears to me, that the question is still unresolved, whether light has a substantial existence, or is a phenomenon depending upon certain operations or conditions of the ordinary forms of matter. But the highly ingenious researches of Count Rumford, on the law of what have been called subtle fluids, and the extraordinary advances lately made by Mr. Davy, on the decomposition of substances, that were hitherto looked upon as elementary, give us reason to hope that future investigations may unfold views of the material world, of which we can at present have only an indistinct conception: that now modes of analysis may enable us to see things, not "through a glass darkly" but more nearly as they are; and that the boundaries of physical and metaphysical science, now so far asunder, may be made to approach each other.

In the present state of our knowledge, our business

In the present state of our knowledge, our business should be to collect, arrange, and compare phenomena, rather than to speculate upon their nature. Nevertheless, I cannot refrain from observing, that the circumstances attending the luminous appearance of living animals, are much more favourable to the supposition of light being a property, than a substance. The quantity of light emitted by an animal in a certain time (admitting it be matter) far exceeds that which could be possibly anount was £41,712,880.

supposed to be derived. Thus the luminous appearance of some Medusæ may be continued with the intermission of short intervals for an indefinite the intermission of short intervals for an indefinite time, notwithstanding the creature be kept in dark-ness, and without any other food than what a small quantity of filtered sea water would afford. The uninterrupted and long continued light that is sometimes evolved by the luminous seas, and the ova of the glow-worm, is also inconsistent with the notion of an accumulation and subsequent dispersion

ova of the glow-worm, is also inconsistent with the notion of an accumulation and subsequent dispersion of a material substance.

I shall terminate this paper by an enumeration of the several conclusions, that are the result of the obrervations I have been able to make upon the phenomena of animal light. The property of emitting light is confined to animals of the simplest organization, the greater number of which are inhabitants of the sea. The luminous property is not constant, but, in general, exists only at certain periods, and in particular states of the animal's body. The power of showing light resides in a peculiar substance or fluid, which is sometimes situated in a particular organ, and at others diffused throughout the animal's body. The light is differently regulated, when the luminous matter exists in the living body, and when it is abstracted from it. In the first case, it is intermitting, or alternated with periods of darkness; is commonly produced or increased by a muscular effort, and is sometimes absolutely dependent upon the will of the animal. In the second case, the luminous appearance is usually permanent until it becomes extinct, after which it may be restored by friction, concussion, and the application of warmth, which last cause operates on the luminous matter (while in the living body) only indirectly by exciting the animal. The luminous matter in all situations, so far from possessing phosphoric properties, is incombustible, and loses the quality of emitting light, by being dried or much heated. The exhibition of light, however long it may be continued, causes no diminution of the bulk of the luminous matter. It does not however long it may be continued, causes no diminu-tion of the bulk of the luminous matter. It does not require the presence of pure air, and is not extinguished by other gases.

extinguished by other gases.

The luminous appearance of living animals is not exhausted by long continuance, or frequent repetition, nor accumulated by exposure to natural light; it is therefore not dependent upon any foreign source, but inheres as a property in a peculiarly organized animal substance or fluid, and is regulated by the same laws which govern all the other functions of living beings. The light of the sea is always produced by living animals, and most frequently by the presence of the Modusa scintillans. When great numbers of this species approached the When great numbers of this species approached the surface, they sometimes coalesce together, and cause that snowy or milky appearance of the sea, which is so alarming to navigators. These animals when congregated on the surface of the water, can produce a flash of light, somewhat like an electric corruscation. When the luminous Meduse are very numerous a feasing the season of the water is confined. corruscation. When the luminous Medusæ are very numerous, as frequently happens in confide bays, they form a considerable portion of the mass of the sea, at which times they render the water heavier, and more nauseous to the taste; it is therefore advisable always to strain s.a water before it is drunk. The luminous property does not appear to have any connection with the economy of the animals that possess it, except in the flying insects, which by that means discover each other at night for the purpose of sexual congress.

for the purpose of sexual congress.

## MINERALS AND METALS.

THE production of coal in the United Kingdom in 1867 reached 104,500,480 tons; that of the United States is said to be estimated at about 25,000,000 tons. Nearly one-fourth of the coal raised in the United Kingdom comes from the Durham and Northumberland coal-fields. There were 2,871 collieries in the United Kingdom in 1857, and 3,258 in 1867; in 1857 the entire production of coal from them was only 65,394,707 tons.
The following statement shows the value of the minerals raised in the United Kingdom in 1867: minerals raised in the United Kingdom in 1867:—
Coal, £26,125,145; iron ore, £3,210,098; tin ore, £624,784; copper ore, £699,693; lead ore, £1,158,066; zinc ore, £41,340; iron pyrites, £67,453; gold quartz, 3,241 tons, £5,320; nickel ore, £14; arsenic, £4,112; gossans, &c., £5,808; wolfram, £62; manganese, £3,232; barytes, £7,807; coprolites £70,300; salt, £836,963; clays, fine and fire £589,650; earthy minerals estimated £650,000 making a total of £34,169,797. The value of the  $\pounds$ 583,650; earthy minerals estimated  $\pounds$ 55,000 making a total of £34,169,797. The value of the metals obtained from these ores in 1867 was as follows:—Iron, £11,902,557; tin, £799,293; copper £831,761; lead, £1,337,509; zinc, £79,693; silver 895,394oz., £215,400; gold, 1,520oz., £5,890; other metals, estimated, £15,000; making a total of £15,000; (30,000) making a total of (30,000) ma £15,187,013. Adding £26,125,145, the value (at the place of production) of the coal raised, and £2,167,933 for other minerals not smelted, salt, clay, &c., the total value of the metals and coal and other minerals produced. other minerals produced in the United Kingdom in 1867 is found to be £48,480,092. In 1866 the

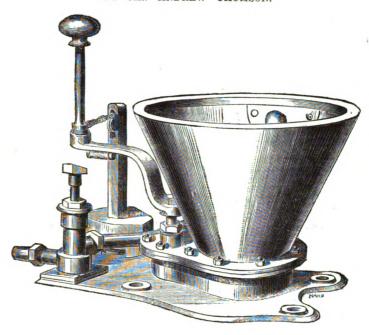


#### THOMSON'S PATENT SHIP WATER-CLOSET.

WE have much pleasure in introducing to notice a water-closet for ships' use, which is the invention of Mr. Andrew Thomson, of Southampton, who holds the position of foreman plumber to the Peninsular and Oriental Steam Navigation Company. The principle on which this water-closet is constructed entirely prevents all leakage and the return of effluvia into the ship after passing the valve, two points of paramount importance, as it is well known that the ammonia in urine forms a crust in the soil pipe, and so causes the offensive smell usually emanating from water-closets of defec-tive construction. On an inspection of the annexed engraving, it will be seen that the handle moves round in a slot cut in the seat. This opens a disc valve, and so cleans its face and at the same time flushes the basin; when the handle is let go, the valve returns to its place, leaving 4in. of water in the basin. The disc valve is worked by an upright the basin. The disc valve is worked by an upright spindle through a stuffing box packed with flax yarn and tallow, completely preventing all leakage from the outside. The supply valve is opened by the lever pressing on the cross-head, and is shut by means of a spring attached to the bottom of the valve; this prevents any waste of water. Twenty years' experience in ships' water-closets constructed on the old principle of pulling up the handle, and trials of every suggested method of curing these defects, all of which have more or less failed, have induced Mr. Thomson to bring forward his patent. We feel assured that it will be ward his patent. We feel assured that it will be found to answer its purpose better than any hitherto in use; in fact, we have numerous testimonials before us in favour of its efficiency.

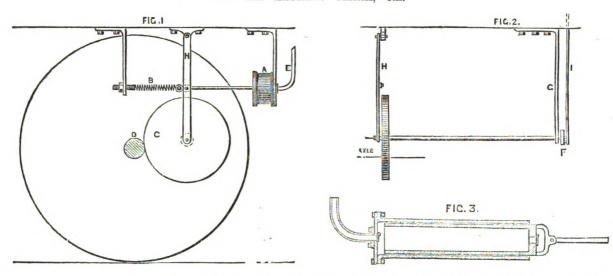
## PATENT SHIP WATER-CLOSET.

BY MR. ANDREW THOMSON.



#### INTERCOMMUNICATION IN RAILWAY TRAINS.

BY MR. LATIMER CLARK, C.E.



#### CLARK'S SYSTEM OF INTERCOMMUNICA-TION IN RAILWAY TRAINS

IN the early part of the year we described a In the early part of the year we described a pneumatic apparatus for signalling in railway trains, invented by Mr. Latimer Clark, C.E. This apparatus has been practically applied on the London, Chatham, and Dover Railway, a satisfactory trial having been recently made in the presence of some forty of the leading railway engineers of the kingdom. In this experiment, when the train was running at speed through a tunnel with the steam blowing off, communication between guard and driver was maintained with the greatest facility. The main feature of this system consists in the employment of powerful bells on the angine in the employment of powerful bells on the engine or tender, and in each of the guards' vans, actuated by the axles of the wheels, and which, therefore, unless thrown out of gear by an arrangement described below, continue to sound loudly as long as the train is in motion. The way in which they are kept out of gear, whilst it is not desired to give a signal, is by the employment of a pneumatic length of the train, being connected between the carriages by short lengths of flexible tubes. A small air-pump is attached to the engine, or to some other part of the train, and, as long as the latter is travelling, produces a partial vacuum (equal to about half a pound to the square inch in in the employment of powerful bells on the engine or tender, and in each of the guards' vans, actuated

the whole length of the tube. of the guards' vans and the te of the guards' vans and the tender a cylinder is fixed, in which a piston is acted upon by the partial vacuum, and throws the bells out of gear as long as the vacuum is maintained. It follows from this that when the train first moves, the bells begin to sound; but immediately afterwards a partial vacuum is produced, and all the bells are thrown out of gear, and therefore remain silent so long as the train continues in motion. If, however, any person, in any part of the train, opens a communication between the tube and the atmosphere, the vacuum is destroyed, and all the bells are brought at once into play, and continue to sound until the communication is reclosed again, or until the train stops. When the guard wishes to signal to the driver, or the driver to the guard, he does so by simply opening a cock communicating

Underneath each | riages and down the ends. The connections between the carriages are made by a short length of india-rubber garden hose. Over each passenger com-partment the tube is supplied with a T-piece, into the lower branch of which a plug is fitted, being connected by means of a chain with a knob or handle inside the compartment. The passenger handle inside the compartment. The passenger pulling down the knob removes this plug, and is prevented raising the handle again by a wedge falling within its shaft. The signal bells are of a size and strength suitable to the rough wear and tear and noise of a railway train. They are protected from dust and dirt by a strong perforated casing. They are struck by hammers, which receive direct motion from the train, and there is therefore no limit to the force which may be amtherefore no limit to the force which may be employed to set them in motion. The motion which

axle D, and thus stopping its motion and the ring-The gong is sounded by the light rod I, fig. 2.

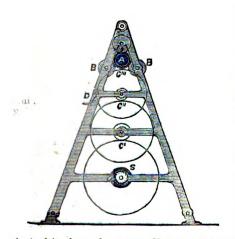
It is obvious that this system is capable of very various modifications. By employing the motion of the train as the source of power, there is, practically, no limit to the energy with which the signal may be given. The employment of a gong, as arranged upon the London, Chatham, and Dover Railway, has the advantage of giving a signal of a nature totally different from any of the other sounds produced by the engine or train. It is also found that a small independently working cylinder underneath the tender and guards van gives a sharp and intermittent whistle. The employment of a fog horn gives a still more powerful sound. But, whichever is the means of signal chosen, it is clear that the air forms a safe and cheap medium of communication, and the apparatus which it requires is little liable to disarrangement from accidental causes.

## ON WAR ROCKETS. BY MR. JAMES NASMYTH, C.E.\*

UNDER the impression that the improvement suggested in the following remarks upon the above-named subject may lead to important results when carried into effect, I have ventured to solicit the favour of the attention of the members of the Manchester Literary and Philosophical Society to the subject, in the hope that it may interest them, and by their kind favour be recorded in their transactions, and so place the suggested improvements in question at the service of the public. The valuable properties possessed by rockets as implements of warfare are so great, that could precision of flight be added, they would rise to a position of the highest importance as destructive agents.

The comparative lightness and portability of rockets, and the fact of their combining gun, charge, shot, or shell, all in one and the same projectile, together with their alarm-producing and highly-destructive properties, has (notwithstand-ing their wildness or uncertainty of flight) caused them to be employed in warfare in many instances with most effective and important results. It is with the object of giving to such rockets all the advantages of rifle action, and so securing pre-cision in their flight, that I desire to suggest means for effecting that important object by an agency that appears to me to be at once simple and effective.

Before proceeding to describe the means whereby I propose to effect the object in question, I would premise that what constitutes the true rifle principle in a projectile is not only the condition of axial rotation in the line of flight, but, above all, is the condition that the projectile possess the highest degree of axial rotation from the first in-



stant of its forward course. Unless this latter condition be present, no subsequent axial rotation, be it eyer so great, can correct a bias or unprecise flight after the flight has commenced. The grand desideratum to be sought for is, that at the instant the rocket commences its flight, it shall possess the highest degree of axial rotation. With such conditions present, we shall confer on our rocket all the properties (as regards precision of flight) of the most perfect rifle projectile.

It is difficult by words alone to convey a per-

fectly clear idea of the mechanical arrangement by which I propose to effect this desirable object. I

have therefore accompanied these remarks with an illustrative diagram of the mechanism by means of which I propose to confer on the rocket the requisite degree of high axial rotation, so that, like a true rifle projectile, it shall possess that indispensable condition of precision of flight from and at the very instant it sets out on its course. Before proceeding to describe the distinctive features of my contrivance for effecting the object in question, it may be as well to allude to the means that have been employed in the endeavour to secure to war rockets rifle action or precision of flight. These consist in placing the rocket in a V-shaped trough, by which the direction and inclination the rocket is suitably secured previous to com-mencing its flight, and so far holding the rocket fair in the direction of the object aimed at. Besides this, an endeavour is made to give the rocket axial rotation during its flight by causing the propulsive gases, while issuing at the rear of the rocket, to rush through skew holes. This latter arrangement does, to a certain extent, give to the rocket axial rotation. But, as axial rotation given by such means does not come into effective operation until the rocket has proceeded a long way on its course, it comes into action too late to have any influence in securing precision of flight.

In order, then, to effect our object, I place the

rocket inside a tube (into which it slides freely); to this tube, which serves to secure the aim of the rocket, I give, by mechanical means, an axial rotation of some thousands of revolutions per minute, which is transmitted to the rocket then resting within it. The rocket, while thus revolving on its axis at the high velocity above named, is then fired, and so rushes forth from its guide tube impressed with all the conditions of a perfect rifle projectile, and, as such, with every condition present that can secure its reaching the object aimed at. Reference to the diagram will enable the reader to obtain a clear idea of the mechanical means and arrangements by which I propose to effect in question. consists of a suitable iron stand, supporting the rocket and its guide tube A, the guide tube resting on loose friction wheels, which, while preserving with the utmost exactness the direction of the axis of the guide tube and rocket, permits the guide tube and rocket to revolve on its axis with all due facility. The requisite amount of axial rotation is conveyed to the guide tube and thence to the rocket resting within it, by means of a powerful clock spring S, transmitting its rotation to the rocket through the train of wheels C 1, C 11, C 111.

Previous to firing the rocket, the wheel C<sup>11</sup> is locked by the catch or trigger D; the spring S is then wound up, and the aim and elevation of the rocket adjusted. The match of the rocket is then lighted, and in order to secure energetic combus-tion of the rocket ere it is allowed to rush forth on its course, the rocket is held in check by three slight springs within the guide tube at the rear of the rocket, by means of which it is not permitted to rush forth until the proper energy of discharge of propulsive gases has been acquired. As soon as this is the case, the rocket frees itself and then rushes forth impressed with and possessing every condition of a true rifle projectile combined with all those important properties which rockets possess as implements of warfare.

#### THE RAINFALL IN CORNWALL.

THE following particulars relating to the rainfall in Cornwall during the past year are taken from a gauge 340ft, above sea level, and correspond more or less closely with four other registers in different parts of the county:—

		Da	ys on which
	Inches.	.01	or more fell.
January	 6.94		23
February	 2.64		22
March	 3.48		20
April	 3.80		13
May	 2.50		14
June	 0.84		7
July	 0.76		10
August	 4.03		20
September	 5.72		13
October	 6.20		22
November	 7.87		16
December	 9.56		30
W-4-1	7101		210
Total	 54.34		210

In 1867 the fall was 48.52, and there were 213 wet days. Average for last for five years, 49 13in. and 212 wet days. TRIAL TRIP OF THE "DECCAN."

ESTERDAY week the "Deccan," which is the most recent addition to the Peninsular and most recent addition to the Fennisular and Oriental Company's ficet, underwent an official trial in Stokes Bay. This fine vessel was built and engined by Messrs. William Denny Brothers of Dumbarton; she closely approximates in size and burden to the "Himalaya." Her principal dimenburden to the "Himalaya." Her principal dimensins are as follows:—Length between perpendiculars, 345ft.; breadth of beam, 42ft; depth of hold, solits; breath of beam, 42ft; depth of hold, 30lft; builders' measurement, 3,001; gross tonnage, 3,128. She is fitted with engines of 600 nominal horse-power (indicating 2,730 during trial), diameter of cylinders, 76in., and length of stroke, 4ft. She has a four-bladed propeller of 18ft. 10in. diameter, with a pitch of  $27\frac{1}{2}$  to  $30\frac{1}{2}$ , weighing  $12\frac{1}{2}$  tons. Two runs at the measured mile showed the following results:—1st Run.—Steam 25lb.; vacuum, 28in.; revolutions, 52; knots, 12-950. 2nd Run. 28in.; revolutions, 52; knots, 12·950. 2nd Kun.—Steam, 25lb.; vacuum, 28in.; revolutions, 52; knots, 14·516, the true mean speed being 13·733 knots per hour. There was a light westerly breeze blowing at the time, and the sea perfectly smooth; barometer, 30·39. The total weight of coals, water, stores, &c., on board was 1,256 tons, and the search of pretaining the search of the and the vessel's draught of water was 18ft. 5in. forward and 19ft. aft, the mean draught being 18ft. 8½in. The heating surface of the boilers is 12,504 square feet, firegrate surface 420 square feet, and condensing surface 5,864 square feet. On leaving Stokes Bay the "Deccan's" head was put to sea, and she ran round the Isle of Wight, steaming from the Warner Light (a stiff westerly breeze which was found to be blowing outside the Wight compelling her to run several miles out to sea) to the Needles in 2hrs. 35min. A sister ship to the "Deccan," to be named the "Hindostan," of 3,000 tons and 600-horse power, is building at Messrs.
Day and Co's iron works at Southampton, and will be ready for sea in August.

## THE SOLWAY VIADUCT.

THE Solway Junction Railway, which has been for several years in course of construction, is now so near completion that it is expected that next month an engine will be able to run over the entire line from Kirtlebridge to Brayton. The permanent rails between Kirtlebridge and the Solway Viaduct are laid, and the station houses are being erected. The viaduct, which is a fine being erected. specimen of engineering, is now finished. Between the English end of the viaduct and the shore an embankment is in course of erection. A line of temporary rails already connects the viaduct with the shore. Some difficulty has been experienced at Bowness Moss. The Moss is about two miles at Bowness Moss. The Moss is about two miles across. A considerable portion of it, however, was drained some years ago, and the remainder is now being drained, and it is expected that it soon will be sufficiently consolidated to carry the rails. The river Wampool is crossed on a viaduct of seven bays. The viaduct is similar to the one over the Solway. A bank of 500 yards connects the shore with the viaduct. The remainder of the line is in a forward state.

#### GRINDING CORN.

A STATEMENT has appeared in the "Journal of the Chamber of Agriculture" by which it appears that we have not yet profited by all the lessons that may be learned from foreigners, and we are far behind some of the continental nations in our methods of preparing our food. Chemists prove to us that the grain of wheat contains exactly the proportions of starch, gluten, fibrine, &c., best adapted for human aliment; but we persist in throwing to the lower animals all but the white inside, or if we try to obey the chemist we make loaves of whole meal—flour and coarse brown bran together—forming a compound that gives heartburn and indigestion to half those who partake of it. But in other countries people are wiser, says the "Journal." The great mills in Pesth have nine pairs of stones, one above another, each pair set to grind more finely than the pair next above, and so the wheat, entering at the top of the mill, is roughly broken by the uppermost pair of stones, divided more effectively by the second pair, more triturated by the third pair, still more by the fourth pair, more and more finely granulated by the fifth, sixth, seventh, and eighth pairs, and finally reduced to a soft powder—flour, sharps, shorts, and bran altogether—by the ninth and lowest pair of stones. The product is precisely conformable to the views of the chemist, and, in addition, makes itself delightfully agreeable, instead of irritating, to everybody's animal physiology. Mechanically ingenious, too, these mills are fitted with stones somewhat differing from those ordinarily seen in Eng-A STATEMENT has appeared in the "Journal of the Chamber of Agriculture" by which it appears



<sup>\*</sup> Corresponding Member of the Manchester Literary and Philosophical Society.

The eye or central opening is very large, so that all the grinding is done between the faces of the stones, far from the centre, and therefore (as reason would point out) where the motion of the runner is most rapid.

So far the "Journal." But Messrs. Chapman and

Co., of Hatcham Mills, referring to this statement, write as follows:—The English are not at all behind continental nations in this respect, as by our process we not only do all that the Pesth millers do, but we consider that it is done in a far superior manner. We have tried various methods, and find manner. We have tried various methods, and find that it is impossible to produce a good flour in the way pointed out, as the effect of grinding the bran with the flour so fine is to kill the flour (as the bakers express it), and thus produce a cake, instead of a light loaf such as is used in this country; besides the danger of rubbing off the faces of the stone by their close contiguity. By our process the flour is first separated; the bran is then ground to the same first separated; the bran is then ground to the same degree of fineness in iron machinery, and afterwards restored to the white flour. By this method we are able to produce a flour for the manufacture of bread free from millstone grit and all the coarser particles of bran, which in the usual way cause indigestion, diarrhoa, &c. Compared with white flour there can be no question of the superiority of this kind of flour, as in addition to the starch, we are enabled to utilize all the other constitutents of the grain—e.g., the gluten or flesh-forming principle, as well as the earthy and alkaline phosphates, for promoting the growth of the bones and teeth—all of which are required in our daily food, more especially in that of young children and the dwellers in large towns and cities.

#### EXPLOSIVE BULLETS.

THERE is a story told of a fat man who objected to fighting a duel with a shadowy antagonist, until his opponent, in the most liberal manner, offered to chalk a line, representing his own proportions, upon the person of the fat man, agreeing, at the same time, that anything which hit outside of that line was not to count. Of some such nature, says the U.S. "Army and Navy Journal," is the agreement recently entered into by the high contracting parties to the Anti-explosive Small-ball Convention, assembled at St. Petersburgh. The Convention, assembled at St. Petersburgh. The purpose of the convention was an amiable one; but where is the power to enforce its provisions? Wars are usually the result of violating treaties, and in what respect does this one differ from the innumerable what respect does this one differfrom the innumerable contracts between governments which have been made waste paper of as soon as interest opposed them? Henceforth, a soldier who is killed by an explosive projectile weighing less than 400 grammes (1402.), will have the satisfaction of knowing that the killing is illegal, and don't count. What more? If the European powers who sign this agreement keep it in case of war, they will do it, not because of the parchment they have put on file, but because the discussions of the convention have satisfied them that nothing is to be gained by the use of explosive bullets. It is fortunate that this conclusion has been arrived at, though we doubt whether a simple certification of this fact would not have answered every purpose of this parchment.

## THE NEW BRIDGE AT NIAGARA.

THE new suspension bridge which spans the Niagara River a short klistance below the cataract has been completed so far that it is passable for foot passengers. This structure, though not so cataract has been completed so far that it is passable for foot passengers. This structure, though not so massive and capacious as that built a mile and a-half below, is at once an object of marked interest. The width and depth of the chasm at this point rendered the construction of this work quite difficult, and makes it an object of attraction as a scientific achievement in the art of engineering. The dimensions of the bridge, as recorded in the "Buffalo Express," are:—The span from rock to rock is 1,190ft.; the span between the centres of the towers is 1,26sft. The length of the suspended platform is 1,240ft. Height above the surface of the river, 190ft. The length of the central portion resting on cables is 635ft. The length of the platform supported by stays and cables is 605ft. The deflection of cables at the centre—in summer, 91ft., and in winter, 88ft., making the rise and fall of the bridge from changes of temperature, 3ft. The length of the cables between the points of suspension in medium temporature is 1,286ft. The length of the cables between the points of suspension in medium temporature is 1,286ft. Height of towers above rock on Canada side, 105ft, and on American side, 100ft. Base of towers, 28ft. square, and top, 4ft. square. The surface of the rock on the American side is 5ft. above that on the Canada side. The height of the roadway above the rock on both sides is 7ift. The depth of the anchor pits below the surface of the ground is 18ft., and the length of the anchor chains under the ground is 30ft. The anchors are set in solid rock on the Canada side, and in masonry on the American side.

the parapets is 10ft., depth of side truss, 6ift., and height of parapet above floor, 4ift. The bridge is supported by two cables, composed of two wire ropes each, which contain respectively 133 No. 9 wires. supported by two cables, composed of two wire ropes each, which contain respectively 183 No. 9 wires. The weight of these wire ropes per lineal foot is 9lb., and the diameter of the cable is 7in. The total weight of the suspended portion of the cable is 82 tons net. There are 48 stays weighing 15 tons net. There are 52 guys connected with the bridge. The aggregate breaking strain of the cable is 1,680 tons net, and that of the stays 1,320 tons net, making the total supporting strength of the cables and stays 3,000 tons. The number of suspenders used is 480, with an aggregate strength of 4,800 tons. The weight of the suspended roadway, including weight of cables and stays, is 250 tons. The ordinary working load is 50 tons, and the maximum load is 100 tons; permanent and transitory load, 350 tons. The towers, when completed, will be covered with wood and corrugated iron, and in point of architectural beauty will be highly ornate, imparting to each terminus of the bridge an air of elegance and substantialness, and rendering the whole an attraction among the beauties and wonders of that interesting locality. On the opening of another season, when the roadway will be completed, it will be available for carriages. be available for carriages.

## Acgal Intelligence.

ROLLS COURT, CHANCERY-LANE. January 11. (Before the MASTER of the ROLLS).

DAW V. ELEY.

OUR readers will no doubt remember that an order was made in this cause, on the motion of Mr. Daw, the plaintiff, to commit Mr. Collette, the solicitor, of Lincoln's-Inn-fields, for contempt of Court, in writing and procuring to be published in the "Volunteer Service Gazette" three letters, under the signature of "Copper-cap," relating to the subject-matter of the suit, and alleged to be in part founded on the pleadings and evidence, with the view of influencing the result of the suit; but the order was not to be drawn up for a fort-night, so as to give Mr. Collette an opportunity of making an apology and paying the costs of the motion. A letter of apology, signed by Mr. Collette, had since been inserted in the "Volunteer Service Gazette" before the fortnight had elapsed. He had, however, declined to pay a bill of £62 for the plaintiff's costs of the motion, on the ground that it was excessive, and offered to refer it to any solicitor of eminence, but his offer was declined.

Mr. Russell Roberts, who appeared on behalf of the plaintiff, now moved the Court to enforce the order to commit Mr. Collette, on the ground that his apology was insufficient, and that the

plaintiff's costs had not been paid. His Lordship having read the letter which was inserted in the "Volunteer Gazette," thought it a sufficient apology. He had intended, when the case was before him, to say that if Mr. Collette would express his regret for having written the letters, and submit to pay the costs of the motion within a fortnight, no order would be drawn up. He could not make a fresh order to commit Mr. Collette, as he had submitted to pay the costs, which must be taxed in the usual way if the parties differed. All that he could now do would be to make an order that the costs should be taxed, and Mr. Collette pay them. He should give no costs of the present application.

## Correspondence.

COLOUR OF STARS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—It is a well-known fact, that in observing the so-called fixed stars through a telescope, they present themselves as mere specks of light, and it is impossible to discern any discal form. If, however, the telescope is lengthened, the stars appear to form discs of faint light. This is perhaps due to the circular form of the objective, as thus the disc is a reflection of the object glass. Giving a triangular form to the objective, one would see the stars, observed in the above manner, as small triangles. So far, the question of the form of the so-called false discs. I should, however, very much like to know if the discs of the coloured stars seen through a refractor of great power, in the above-monitoned way, send to the retina the same colour as that of the star. For example:—Eta Lyrae is a blue star; is the false disc blue also?—I am, Sir, yours, &c.,

Delft, January 9. Delit, January 9.

INVENTORS AND INVENTIONS.

INVENTORS AND INVENTIONS.

SIR,—Another inventor is dead. Mr. Chalmers, who for the past eight years has been urging upon the Admiralty, as well as the writer, the value of the cellular mode of constructing shield armour, and affixing it to the sides of ships of war, instead of the solid armour, which is so expensive, and causes ships of war to roll so much at sea. It is reported that Mr. Chalmers leaves a widow and family in very atraitmed circumstances, just as the second that Mr. Chalmers leaves a widow and family in very straitened circumstances, just as the second target ordered by the authorities was on the eve of completion for further experiments. Now, 'tis a fact that the former target in its resistive properties was greatly superior to any description of solid armour at the time tested: and the superiority of the cellular mode of constructing and affixing such built-up shield armour has been for some time admitted by all practical men. This mode of construction also fermed a part of the proceedings of the naval architects' meetings, held in the Society of Arts, carring 1867, in which discussion I took part, in connection with Mr. Scott Russell and other scientific practical men, upon which occasion it was scientific practical men, upon which occasion it was admitted that the construction of shield armour for admitted that the construction of shield armour for ships and fortifications, constructed upon what is called the girder cellular plan, and the interstices filled up with wood, would effectively absorb the effect of the blow from shot, and so be greatly superior in results to heavy solid armour plates. It is unfortunate Mr. Chalmers has now ceased to be with us in life to see the adoption of the plan, but such seems to be the general fate of all inventors. Many of them, which history proves, starve while they live, and are by many, far too many, looked upon as the pests of society, and treated as though they were impostors; and thus as the result, generally speaking, inventors die early—in other words, relly speaking, inventors die early—in other words, before the time comes when their inventions are duly appreciated, and themselves respected and rewarded.

How long is such a state of things to last? When

rewarded.

How long is such a state of things to last? When shall the manufacturing commercial classes, and especially the Government, awake up to and admit the fact that inventors and inventions form the basis of England's wealth and greatness—that proportionably as geuius is fostered, and correct inventions practically developed, just in the same proportion do we English hold the power, and make the way open to extending commerce and commercial prosperity. What shall the Tyne develope during the incoming year? Is there any latent plan undeveloped? Is the bituminous coal of Tyneside, and our counties of Northumberland and Durham, to go to the wall, so to speak, by Welch coal, because the bituminous coal makes smoke, which Welch coal does not? Are all the furnace plans failures, or is it the fault in the cause of mechanical connections which get out of order, or what? That's a question worth working, for the coal trade is bad in the districts referred to, and the fact is—that although the steam coal of this our district for steam generating purposes is better and cheaper, and in every respect superior to Welch coal, yet Welch coal is taking the steam coal trade, and the Hartley and other once steemed coals of this district have been put off the Admiralty list this year, and I know it as a fact that an order from the Turkish Government for coal for their ships of war has been given to Wales for Welch coal solely on account of the smoke which is emitted from the burning of bituminous coal.

What is to be done? It is simply this—let the steam coal trade agree to try some new plan by which their coals can and will be used in boiler furnaces, which plan does not specially depend upon careful stoking i.e., firemen or any jimcrack appliances, and then I will venture to predict there are

furnaces, which plan does not specially depend upon careful stoking i.e., firemen or any jimcrack appliances, and then I will venture to predict there are better times coming for our pitmen, sailors, steamship owners, but especially colliery owners; and this next year, if they lose no time, will at once prove the value of my plan, which is approved of by many practical men—whom I can refer the colliery owners to by name—will be a good new year, proving the fact that the steam coals of this district (Newesstle and Durham) are the cheapest and best in the world yet discovered for steam generating purposes, which I will personally undertake to prove weight for weight with coals. I will challenge such Welch coal in any properly constructed boiler furnace to generate as much steam as can be generated by supposed I am altogether personal, I suggest let the the steam coals of our localities. Less it should be supposed I am altogether personal, I suggest let the coal trade advertise for and agree to develope and adopt the plan which will enable the bituminous coals to be burnt without smoke and without mechanics. nical connections or the special attention of firemen.

—I am, Sir, yours, &c.,
London, January 12. G. BELL GALLOWAY.

On Monday last, the first compensation cases in reference to the new National Gallery came on before special juries, under the presidency of Mr. Under Sheriff Burchell, at the Sheriffs' Court, Red Lionsquare. The vicar and churchwardens of St. Martin's-in-the-Fields, for the library and school of Archbishop Tenison, were awarded £9,900, and the governors of the parochial school £7,500.



#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in

advance.
Alliterary communications should be addressed to the Editor of the Mechanics' Magazine. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. B. Smiles, Mechanics' Magazine Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, ED. M. M.
Advertisements are inserted in the MECHANICS' Magazine.

faith, ED. M. M.
Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type Special arrangements made for large advertisements.

Enquirer, M.—If you add 500deg, of heat to the 1,200deg already attained by the firebars, you will decidedly bring your bars down.

NECEIVED.—T. C.—J. R.—R. F. F.—H. D.—J. F.—J. N. E. P.—W. S.—W. J.—R. F.—M. F. L.—R. I.—A. de B.—C. J.—F. B.—J. G.—M. S.—R. F. F.—T. M.—J. H.—G. C.—B. B.—G. E. P.—J. N.—L. O.—M. S. B.—T. C. H.—G. W. H.—R. M.—J. W.—S. E.—W. G.—R. F.—E. P. D.—P. S. N.—G. R.—W. P. S.—J. F.—J. C. E.

## Meetings for the Week.

Mon.—Royal United Service Institution.—Captain E. A. Inglefield, R.N., F.R.S., on "His New Hydraulic Steering Apparatus, as being fitted to H.M. Ship "Achilles." Licutenant Arthur H. Gilmore, R.N., Will Exhibit his New Expanding Plug for Stopping Shot Holes, and New Sponge for Artillery Practice, at 8.30 nm.

New Sponge for Artillery Practice, at 8.30 p.m.
Society of Engineers.—The President for 1869 will deliver his Inaugural Address, and also present the Premiums awarded for papers read during the year 1863. There will be a Ballot for the Election of New Members, at 7.30 p.m.
Tues.—Royal Institution.—Mr. R. Westmacott, on "Fine Art" at 2 p.m.

Tues.—Royal Institution.—Mr. R. Westmacott, on "Fine Art," at 3 p.m.

The Institution of Civil Engineers.—Renewed discussion upon "Mechanical Appliances for Getting Coal"; and, time permitting, a Paper will be read on "New Forry and New Brighton Piers," by Henry Hooper, Assoc. Inst. C.E., at 8 p.m.

Thurs.—Royal Institution.—Mr. Rupert Jones on "Protovan" at 3 p.m.

TRUEB.—Boysa Institution.—Mr. Herschel on "The Last Eclipse of the Sun," at 8 p.m.

SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

## Mabal, Military, and Gunnery Items.

THE steam fleet owned by the Peninsular and

THE steam fleet owned by the Peninsular and Oriental Company comprises a total of 48 oceangoing vessels, having an aggregate tonnage of 85,632 tons and 18,620-horse power.

It is stated that General the Hon. Sir Charles Gore, G.C.B., K.H., colonel of the 6th Foot, will succeed to the post of Lieutenant-Governor of Chelsea Hospital, vacant by the death of the late Field Marshal Sir Hew Dalrymple Ross.

The Viceroy of Egypt has deputed Colonel Muchir and Fingari Bey to visit France, England, Holland, Belgium, and Prussia in order to study the systems and implements of agriculture in the schools

systems and implements of agriculture in the schools of husbandry in those countries, and present reports

on the subject.

The "Monarch" is ordered to be fitted up with

THE "Monarch" is ordered to be fitted up with Gurney's gas apparatus, every portion of the vessel, between decks, being intended to be lighted by gas, which will be manufactured on board. The estimated expense of fitting up Gurney's apparatus is about £300.

SIR JAMES A. GORDON died this day week at Greenwich Hospital, of which he was governor, at the age of 86. This gallant and veteran officer was admiral of the fleet, and had served in the Royal Navy for the extraordinary period of 75‡ years. He was, we believe, the last survivor of Nelson's noble band of captains.

The guns in the park at Waterford were found on

THE guns in the park at Waterford were found or Monday morning to have been overturned from their carriages, and lying on the ground. They were restored to their former position in the course of the day by direction of the mayor. Nothing has been

day by direction of the mayor. Nothing has been ascertained of the perpetrators.

WE understand that Mr. Childers intends to effect the vast economy which will ensue by closing the Royal dockyards of Woolwich and Deptford with as little delay as will be compatible with the exigencies of the service. Two very important pieces of patronage which hitherto have been vested in the hands of the First Lord of the Admiralty will thus be abolished—these are the post of captain-superintendent of each yard. tendent of each yard.

A LETTER from Rome states that the Prussian Legation is taking earnest steps at the Vatican to obtain permission for the German soldiers of the Reformed religion in the Papal army to have the consolations of religion administered to them, when

needful, by pastors of their own form of belief. The number of Protestant combatants under the Ponti-fical flag is increasing every day, but all who die are invariably interred in the Roman Catholic

THE engines of the "Hercules," of the nominal power of 1,250-horse, and manufactured by Messrs. John Penn and Son, exhibited at the recent trial of the ship over the measured mile off Portsmouth an indicated power exceeding 8,500-horse, the greatest proportion of indicated to nominal power ever yet attained. The "Hercules" is ordered to make a six hours' trial at sea under similar conditions to those imposed upon the trials of the "Minotaur, "Warrior," and "Bellerophon."

"Warrior," and "Bellerophon."

THE wooden unarmoured screw frigate "Sutlej" is now having the last pieces of her machinery taken out alongside Portsmouth dockyard, preparatory to being taken into the breaking-up dock. It was only out alongside Portsmouth dockyard, preparatory to being taken into the breaking-up dock. It was only in October, 1860, that the "Sutlej" made her first speed trial as a new ship over the measured mile in Stokes Bay, when she attained a mean rate of speed of 13-076 knots per hour. She was then considered one of the handsomest and swiftest ships affect. She is now a striking illustration of the short life and costliness of a wooden-built ship of war.

In addition to the double screw iron armour-plated turret ship "Cerberus," just completed at the yard of the Palmer Shipbuilding Company, Jarrow-on-Tyne, for the defence of alelbourne, the Government

of the Palmer Shipbuilding Company, Jarrow-on-Tyne, for the defence of Melbourne, the Government has ordered two other armour-plated turret ships—the "Abyssinia" and the "Magdala"—to be constructed for the defence of Bombay, both vessels being built from the same drawings and patterns as the "Cerberus." We hear that the contract for building the "Abyssinia" has been taken by Messrs. Dudgeon, of Poplar, and that for the "Magdala" by the Thames Iron Shipbuilding Company, Blackwall.

Aninteresting meeting of the pilots of Liverpool was held yesterday week in the Bee Hotel, Queen-square, Liverpool. The occasion was the arrival at Liverpool of Mr. George Osgood, a pilot of New Orleans, who had been brought involuntarily across the Atlantic, owing to stress of weather, on board the ship "Expounder," of Boston (Captain Irvine), bound from New Orleans for the Mersey. An event such as this occurs at intervals of a few years, and the pilots at the port to which one of the same profession may be brought invariably treat him with the greatest hospitality. Tossts expressive of mutual friendship between the two countries were proposed and heartily received.

We are enabled, on the authority of the "Army and Navy Gazette," to state that there is no intention, and there never was any, of disbanding the Marines. The distinguished corps will continue to exist and be ready when called upon to maintain the high reputation which it has acquired, but in such reduced numbers as the altered state of the day demands. The reduction spoken of for the Royal Artillery would bring the arm in guns and horses very much to the state in which it was before the Crimean war. The troops and batteries would lose two guns each, and a corresponding number of

the Crimean war. The troops and batteries would lose two guns each, and a corresponding number of horses and men. However, no plan is yet approved

of definitively.

An old sailor, called Loubin, lately got away from An old sailor, called Loubin, lately got away from the galleys at Toulon. From the description of this gentleman, he seems to be exceedingly pictorial. He has on his right arm the bust of a woman, the bust of a man, a boat, and anchor, a savage, and a heart with a dagger in it; on the wrist a bracelet, on the hand a heart. On the left arm the bust of a woman, the name Adele, a woman, a dancing girl, two hearts with daggers, Louise, 1850, and a dove; on the wrist A, and a bracelet. On his chest two busts meant to represent the Emperor and Empress, and two doves holding a crown. On the right knee obseene designs. It certainly ought not to be difficult to reconize M. Loubin.

## Miscellanen.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending January 9, was 7,017. Total number since the opening of the Museum free daily (May 12, 1858), 1,476,326.

THE first All-England match of the year took place at Horsington, Lincolnshire, on Tuesday, January 5, and was won by Mr. Goodyear with one of Messrs. Ransomes ploughs against seven competitors.

A commission charged, on the proposition of the Royal Academy of Medicine, in Belgium, with an inquiry into the propriety of employing women in mines, has sent in its report, which expresses the opinion that females ought to be excluded from such unations

MESSRS. ROTHWELL, the contractors for the ere MESSRS. ROTHWELL, the contractors for the erection of the pumping engines at the Abbey Mills Pumping Station, have hitherto had the working of the engines, but as that duty will now devolve upon the Metropolitan Board of Works, that Board has appointed Mr. Usher, who has been engaged in superintending, under the direction of the engineer and assistant engineer, the erection of the machinery, to the effice of superintendent of the station. to the office of superintendent of the station.

THE commission appointed to select names

The commission appointed to select names of artists for the election of a foreign member of the Paris Academy of Arts, in the room of the late composer, Rossini, presented the three following:—Sir Edwin Landseer, R.A.; M. Dracke, Prussian sculptor; M. Dupré, also sculptor, of Florence. On the reception of the list, the Academy, according to custom, added other names—those of M. L. Gallait, Belgian painter; Signor Pietra Rosa, architect and archieologist, of Rome; and M. Geefs, the well-known sculptor,

In 1855 the number of silk looms at work in the canton of Zurich was 25,290, employing 32,862 weavers. During the most prosperous years of the silk trade, from 1858 to 1860, the number was 28,000, employing 37,000 weavers. Since then there has been a great falling off in this manufacture, and in 1867, though more active than the preceding years, the total number of silk looms was only 18,276, employing 26,883 weavers; and, although this trade is gradually improving, it will be many years before it regains its former prosperity. The total value of silk stuffs manufactured during 1855 was 8,291,406f., and in 1867 it amounted to 7,279,810f.

The tunnel under the Chicago river, known as the Washington-street Tunnel, connecting the south and west divisions of the city by a solid and permanent roadway, has just been completed, and was opened to the public on New Year's-day. The contract price was 328,500 dollars. The length of the work is about 1,605ft.; of the retaining walls of the open approach on the west side, about 320ft, and 275ft on the east side. The length of the main archway, or covered way, is 932ft. There are three archways leading through the tunnel; one is for foot passengers, and two for teams and horses.

Of the 4,141 miles of railways open in Prussia in

archways leading through the tunnel; one is for foot passengers, and two for teams and horses.

Or the 4,141 miles of railways open in Prussia in 1866, 1,959 miles, or nearly one half, are under State management. The Prussian Government is therefore now managing (without taking any account of the railways in the annexed provinces) 1,959 miles, although the State originally constructed only 1,061 miles so that State management has been extended

although the State originally constructed only 1,061 miles, so that State management has been extended to 897 miles constructed by private companies. In the whole of Germany, including Prussia, the preponderance of State management is still greater, the number of miles worked by the different States being 5,142, and only 3,840 miles are worked by companies. ENGLISH machinery is being largely employed by the natives of Siam. The Siamese dockyards are busy building and repairing steamers; iron bridges have been erected over some of the creeks; gas works constructed in the palaces of the king and prime minister; two steam dredges put together and set to work; and another steam rice mill added to the four large mills already existing. A large sugar mill and distillery; a saw mill; British ship-yard and drydock, have been in operation since the beginning of 1867; and as the supplies for all these come almost entirely from England, there must be a very considerable export of British machinery going on to the East.

THE imports of raw cotton into France, in the first THE imports of raw cotton into France, in the first nine months of 1868 amounted to 87,806 tons, as compared with 82,552 tons in the corresponding period of 1866. The United States sent France 40,102 tons to September 30, 1868, as compared with 35,974 tons in 1867, and 40,691 tons in 1866 (corresponding period). The imports of cotton into France from the United Kingdom to September 30, 1868, as 12,655 tons in 1866. 1868, amounted to 13,651 tons, as compared with 19,080 tons in 1867, and 33,984 tons in 1866 (corresponding periods). British India sent France 11,672 sponding periods). British India sent France 11,672 tons of raw cotton to September 30, 1868, as compared with 9,067 tons in 1867, and 7,080 tons in 1866

(corresponding periods).

A MICHIGAN paper reports the discovery of a gigantic human skeleton in a rock near the Sank Rapids. It says:—"The head is massive, measures Rapids. It says:—"The head is massive, measures 31½in, in circumference, low in the os frontis, and very flat on the top. The femur measures 26½in, and the fibula, 25½in, while the body is equally long in proportion. From the crown of the head to the sole of the foot, the length is 10ft. 9½in. The measure round the chest is 59½in. This giant must have weighed at least 900lb, when covered with a reasonable amount of flesh. The petrified remains, and there is nothing left but the naked bones, now weigh 304½lb. The thumb and fingers of the left hand and the left foot from the ankle to the toes are gone, but all the other parts are perfect. Verily, there were giants in those days!

all the other parts are perfect. Verily, there were giants in those days!

THE announcement that in Canada illuminating gas has been successfully produced from petroleum refuse has created much interest in this country; but it would be desirable to learn the character of the refuse employed. It is stated that by sending a stream of air, by means of an air-pump, through a cask of petroleum refuse, it becomes charged with vapour from the petroleum, and burns with the brilliancy of ordinary gas. Without some further description it can only be supposed that the refuse used is the light and more volatile constituents. If Mongreul, described some years since in the Mongreul, described some years since in the "Mining Journal." If it be not the more volatile constituents, the invention is impracticable, as the air will not act as a carrier to the vapours to a sufficient extent to give it a commercial value.



# Patents for Zubentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprictors of this Magazino. Other papers are hereby warned not to produce them without an acknowledgment.—

BOILERS AND FURNACES-2075, 2080, 2039, 2091, 2115
BUILDINGS AND BUILDING MATERIALS-2073, 2095, 2097, 2111, 2123

2111, 2123
CHEMISTRY AND PHOTOGRAPHY—2065, 2067, 2072, 2088, 2090, 2112, 2216
CULTIVATION OF THE SOIL, including agricultural implements and machines—2118
ELECTRICAL APPARATUS—None.
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2070, 2071, 2078, 2081, 2082, 2035, 2110, 2120

2120
POOD AND BEVERAGES, including the apparatus for preparing food for men and animals—None.
PURNITURE AND APPAREL, including household utensils, time-keepers, jewellery. musical instruments, &c.—2086, 2087, 2114, 2119

TOSS, 2037, 2114, 2119
GENERAL MACHINERY—2093, 2094, 2099, 2100
LIGHTING, HEATING, AND VENTILATING—None.
MERALS, including apparatus for their manufacture

MRIALS, including apparatus for their manufacture—None.

MISCELLANKOUS—2063, 2074, 2074, 2079, 2083, 2084, 2103, 2105, 2106, 2103, 2113, 2117

BOADS AND VEHICLES, including railway plant and carriages, saddiery, and harness, &c.—2069, 2092, 2107, 2109, 2121, 2122

SHIPS AND BOATS, including their fittings—2076, 2098

STEAM ENGINES—2101

WARFARE—2066, 2077, 2096

2065 T. B. Hodde, Adam-street, Adelphi, Use of hydro-carbonaceous fluids. Dated June 27, 1868.
The documents relating to this invention are with the law officers under objection, and therefore at present cannot be seen.

not be seen.

2066 B. WARRY, Gillingham, Kent. \*\*Breech-leading frearms. Dated June 27, 1863.

This invention consists in certain improved combinations and arrangement of mechanism in the construction of breech-loading frearms, in which central-fre ammunition is employed. The details of the invention are voluminous.—Patent abandoned.

minous.—Patent abandoned.

2067 J. Baggs and F. Brary, Camberwell, Surrey. Extraction and condensation of ammonia. Dated June 27, 1863.

The first part of this invention consists in blowing atmospheric air or carbonic acid or other gas capable of carrying the ammonia forward through a solution of ammonia contained in a close vessel, and then causing the air or gas so charged with ammonia to blow or pass through a metallic or saline solution, capable of arresting the ammonia, and of being decomposed thereby, and so forming the various ammoniacal salts. In the second part of the invention, a partial vacuum is formed, and used instead of pressure by means of a bellows, force pump, or other suitable contrivance adapted to the purpose.—Patent completed.

pleted.

2052 C. MATHER, Sulford. Eccarating or loosening and removing soil, &c. Dated June 27, 1868.

This invention consists in the application of a jet of water under pressure for loosening and removing soil and other deposits from the beds of rivers or other places where excavations are required.—Patent completed.

2059 J. Bowker and J. Ivers, Chowbent, Leigh, Lancashire. Replacing on the line of rails of metals, engines, tenders, &c. Dated June 27, 1868.

Luncashire. Explacing on the line of rails of metals, engines, tenders, &c. Dated June 27, 1868.

This invention consists in the application, adaptation, and construction of certain apparatus, which the inventors call slips. They construct these slips by preference of wrought-iron plates, and from each slip of two inclined planes, which embrace the rail on both sides, one inclined planes, which embrace the rail on both sides, one inclined plane being on each side of the rail, and the two being connected together across the top of the rail. These slips are used in pairs, one on each rail (they being made right and left hand), and are formed of the shape of the letter V, with flanges on each side to guide the wheels of the engine or other carriage. These slips are likewise furnished with points or guards to guide the wheels directly on to the rail. The engine or carriage being brought contiguous to the rails, it is drawn up the slips, by which action it is at once placed thereon in its proper position for work.—Patent abandoned.

2070 J. TYSON, Sparkbridge, near Ulverstone, Lanca-nire. Machinery used in the manufacture of bobbins. Dated June 27, 1868.

June 27, 1863.

This invention has for its object the roughing or forming the blocks from which to manufacture bobbins, and the boring such blocks at one operation, which the inventor effects by means of a tubular saw, having a revolving and reciprocating motion applied thereto, so as to pass along or through a block of wood held in position by a toothed instrument. Inside the tubular saw, and advancing therewith, is a boring bit, so as to bore a hole through the centre of the block, at the time the tubular saw is forming the outside thereof. The block is removed, and another is advanced and pressed to the toothed instrument above mentioned by means of weights, and held there until traversed by the tubular saw and boring bit, as above described—Patent abandoned.

2021 G. McCullock, Manchester. Thread polithing

2071 G. MCCULLOCH, Manchester. Thread polishing machines. Dated June 27, 1868.
This invention consists in the application of thread polishing machines of improved solf-acting spreading motions, for laying the threads side by side on the rollers,

instead of by hand as at present, and in an improved self-acting arrangement for giving the required tension to the threads on the rollers.—Patent completed.

acting arrangement for giving the required tension to the threads on the rollers.—Patent completed.

2072 W. F. DEANE, Farnworth, near Bolton. Obtaining oxide of manganese. Dated June 27, 1868.
Under one process, the inventor takes the residual still liquor of the manufacture of chlorine, and conveys it into a strong closed vessel containing carbonate of lime, and thereby evolves carbonic acid gas. The said carbonic acid gas is led by a pipe or pipes through a Cowper's or other furnace, and heated to the required temperrure. The heated carbonic acid gas is conducted into another strong vessel containing neutralized still liquor. The said neutralized liquor is agitated by the carbonic acid gas as it enters, and is also thereby subjected to the heat and pressure necessary to cause the desired reaction, and effect the transformation of the chloride of manganese has been converted into a carbonate of manganese. When the chloride of manganese, and this can be ascertained by the disappearance of the chloride from the supernatent liquor of the carbonate of lime, and it is removed and washed and heated in contact with the atmosphere, in accordance with a well-known reaction to convert the carbonate into oxide of manganese. Should the residual still liquor not contain unfficient acid, hydrochloric acid of greater strength can be added; in many works, weak acids from the condensing towers can be utilized for the purpose.—Patent abandoned.

towers can be utilized for the purpose.—Patent abandoned.

2073 H. Large, Notting-hill, London. Machinery for making bricks. Dated June 27, 1868.

This invention relates to that class of brick-making machinery which is employed to make hard bricks, and especially those which do not require burning. In carrying out the invention, the materials of which the bricks are to be made, when properly mixed, are placed in a mould, which is then brought under a plunger worked by a crank, pin, eccentric, or other equivalent mechanica-device, whereby the materials in the mould will become consolidated and compressed into the form of a brick. The mould with the compressed brick therein is then earried forward to a second plunger, the rod of which is connected by a rocking lever to the rod of the first plunger, so that immediately after a brick has been compressed, the brick that has just been passed forward will, by the descent of the second platon, be forced out of the mould into a receiving table attached to the end of a weighted lever, from which the finished brick is removed by hand, and then the table is carried up by the weighted lever into its original position, ready to receive another brick—Patent completed.

2074 G. H. Wilson, Sherwood-street, Golden-square,

lever into its original position, ready to receive another brick—Patent completed.

2074 G. H. WILSON, Sherwood-street, Golden-square, London. Apparatus for holding or winding tape measures, &c. Dated June 27, 1863.

This invention mainly consists in the arrangement in a case or holder, as hereafter described, of two wheels, two pinious, a roller which receives the measure, and a barrel containing a spring. The barrel is fixed, and contains a recoiling spring, having for its centre an arbor which has on the pivot, working just free of the barrel cover, a wheel driving a pinion, to which is affixed another wheel driving another pinion. This second pinion forms the axis of the roller, on which the measure is wound, having for its working centres a hole in the top of the inner case, and a hole in the barrel arbor. The case or apparatus is provided with a check action, consisting preferably, of a spring and ratchet wheel, the spring having a nib or pawl, and is fixed on the inside of the inner case, so as to lock or take into the teeth of the ratchet which revolves with the roller as the measure or band is drawn out. A spring with a projecting nut or finger-piece is fixed on the upper end of the inner case, and, when this nut is pressed, the locking apring is forced out of the ratchet teeth, the wheels being thus immediately relieved, and the measure or band being caused, by the action of the ratchet teeth, the wheels being thus immediately relieved, and the measure or band being caused, by the action of the ratchet teeth, the wheels being thus immediately relieved, and the measure or band being caused, by the action of the spring barrel, to fly back, and wind upon the roller.—Patent completed.

caused, by the action of the spring barret, to by cack, and wind upon the roller.—Patent completed.

2075 J. Morris, Middlesborough, York. Steam boilers. Dated June 27, 1868.

This invention has for its object an increase in the power and efficiency of boilers, particularly, for instance, those of the vertical class, and is especially adapted for those that receive the products of combustion from puddling or heating furnaces, and are known as stack boilers. The patentee uses an inner tube or flue extending from the top to the bottom, and through which the products of combustion pass. This tube is enlarged towards the lower part, forming a chamber, which he prefers should be a conical one, the apex of the cone being downwards, and the base being made convex upwards. Across this chamber, a table, by preference of cylindrical form, is fixed, which should be large enough to admits aman's body, and planted upon this cross tube is a saddle or chamber forming part of it, and the shape of which corresponds to the shape of the conical chamber around and above it. From the inner chamber to the outer one extend tubes, by preference of a conical or cylindrical form. These tubes, which may be eight in number (or more or less if desired), are arranged at about equal distances apart, all round the chamber, and he prefers that they should radiate outwards with the larger ends upwards. The outer shell of the boiler has at least two manholes, one in the upper part of the boiler, and another just opposite the cross tube aforesaid, in order to gain entrance to it. There are various modifications.

Patent completed.

Patent completed.

2076 R. SMITH, Islington. Preenting the fouling of iron and other thips bottoms. Dated June 27, 1868.

The inventor places a pipe along each side of the keel, stem, and stempost of the ship to be protected. These pipes he fills with a compound generating or producing a strong gas or vapour, capable of destroying barnacles, animalcule, or other animal or vegetable life liable to foul the ship's bottom. The gas escaping through perforations provided in the above mentioned pipes mingles with the air in the surrounding water, and, by destroying all animalcules in the vicinity of the ship, effectually prevents the fouling of the bottom. The ingredients of which the composition above mentioned is composed, are as follows:
—Sulphur, resin, and fish or other oil, in about equal proportions. For resin, raw turpentine or pitch may be substituted, if desired. The above ingredients are mixed together by heat, and are reduced to a plastic mass, with which the pipes are completely filled.—Patent abandoned.

2077 W. C. STIFF, Birmingham. Breech-loading frearms

2017 W. C. STIFF, Birmingham. Breech-loading frearms nd ordnance. Dated June 27, 1868.

These improvements have reference to breech-loading frearms, in which a sliding plug or closer is employed for

opening and closing the breech. The improvements consist, first, in making the opening at the top of the breech chamber or shoe through which the cartridge is introduced into the said chamber in the following manner:—The inventor makes the said opening of a length about equal to one-half the length of the cartridge, and the front part or end of a breadth equal to the diameter of the fore part of the cartridge, the rear end of the said opening being made of a diameter somewhat greater than that of the rim of the cartridge. In introducing the cartridge it is held in an inclined position, the projectile end being highest. The base of the cartridge is introduced into the rear end of the opening, and the cartridge prossed backwards, until the projectile or fore end falls into the breech chamber. By the pushing home of the sliding plug, the cartridge is pushed forward to its place in the barrel. When self-consuming cartridges are employed, no extractor is required, but when metallic cartridges or cartridges the cases of which require to be extracted after discharge are employed, the uses an extractor which withdraws the cartidge by its rim. In order to remove the extracted case from the breech chamber or shoe, he employs the arrangement constituting the second part of his invention. The improvements consist, second, in making, on the under side of the breech chamber or shoe, an opening nearly equal in length to the case of an exploded cartridge. The said opening is situated at the rear end of the said breech chamber or shoe, its front end approaching, but not being quite under, the rear end of the opening at the top of the said opening is situated at the rear end of the said breech chamber or shoe, its front end approaching, but not being quite under, the rear end of the opening at the top of the said breech chamber the enthefore described. When the cartridge case has been withdrawn from the barrel by the extractor, and is brought over the said opening, the weight of the base of the said case causes the front end to

chamber than when it is rigid.—Patent abandoned.

2078 W. B. LAKE, Southampton-hulldings, Chancery-lane. Apparatus for dycing textite fabrics. (A communication). Dated June 27, 1868.

The patentee claims, first, subjecting the articles or substances to be dyed to a process whereby the oxygenation of the materials is effected in a continuous automatic manuer. Second, dyeing in an open vessel under the pressure of steam, substantially as set forth. Third, the rotating cylinder enclosed in the tank, and constructed and operating substantially as and for the purpose set forth.—Patent completed.

2079 G. HANNAH, Haughton-le-Skerne, near Darling-ton. Fluid meters. Dated June 27, 1863.

The nature of this invention consists in the combination of a piston working segmentally to and fro in an annular chamber with a double piston working in a section of the same annular chamber, or in a straight line; also in the arrangements and construction of pistons, valves, and indicators applicable thereto. The invention is not de-scribed apart from the drawings.—Patent completed.

scribed apart from the drawings.—Patent completed.

2080 J. WARDMAN and J. and F. Baldwin, Sandbeds,
near Bingley, York. Steam botters. Dated June 29, 1863.

The object of this invention is to construct a steam
boiler occupying less room than horestore, for a given
amount of horse power, together with a more rapid circulation, and a greater heating surface and larger steam
space than any boiler of equal length and diameter constructed on the Cornish or other known principle.—Patent
abandoned

2081 W. BANTER, D. WARING, and J. S. WOOLER, Bradd. Apparatus for drying textile fubrics. Dated June 29,

2081 W. BANTER, D. WARING, and J. S. WOOLBE, DIRECTORD. Apparatus for drying textile fabrics. Dated June 29, 7868.

This invention consists in the construction and use of apparatus for the purposes set forth, comprising a series of metal pipes connected together in sets, forming grated platforms of shelves arranged in tiers one above another, either fixed or movable, and so that steam, water, or air may circulate therein, and may be enclosed (or not) in a room or chamber for air to be forced or drawn through them when used for drying rags, fabrics, or fibrous substances, or immersed in the liquid when used for heating cooling, and evaporating the same.—Patent completed.

cooing, and evaporating the same.—Fatent completed.

2082 R. SHAW and J. CLAYTON, Higher Walton, near
Preston. Looms. Dated June 29, 1863.

This invention relates to the yarn beam and weighting
motion of the loom, and consists in improved modes of
suspending the beam by the yarn for the purpose of causing the beam and yarn upon it to act as a weight for
weighting the yarn and keeping it at its proper tension.—
Patent completed.

2083 H. JEWITT, Leighton-road, London.

2033 H. Jewitt, Leighton-road, London. A new toy, in the shape of a mortar or spring gun. (A communication). Dated June 29, 1868.

This invention relates to a new toy in the shape of a mortar or spring gup, and consists in constructing the said mortar or gun so that, on pulling a string attached to the mortar, and by turning a central spindle passing through the gun, a ball or other article is projected at a great velocity from the muzzle of the said mortar or gun.—Patent abandoned.

great velocity from the muzzle of the said mortar or gun.—Patent abandoned.

2034 A. V. Newton, Chancery-lane. Liquid meters. (A communication). Dated June 29, 1863.

These improvements in liquid meters relate to the use of two double-acting cylinders, two pistons, and two valves with corresponding parts, the whole so arranged that the valve or valve stem belonging to the one cylinder and piston forms the guide for the other piston, and moves with it, and vice evrs. The pistons thus arranged are packed with elastic rolls. The invention also includes a new balanced sleeve valve and a new and improved mode of transforming the reciprocating motion taken from the moving parts into the rotary motion given to the registering apparatus. It also combines the advantages of a double crank meter without its disadvantages, and the moving of the valves directly by the pistons. Also the use of a crank shaft, thus arranged for moving the registering wheels, and also a mode of forming the fluid-tight joints of the valves by means of rubber rolls, which cheapens their construction, and admits of the passage of impurities without injury.—Patent completed.

2085 C. E. Brooman, Fleet-street. Apparatus for bleach-

2085 C. E. BROOMAN, Flect-street. Apparatus for bleachag or lixiriating fabrics and skeins. (A communication).
ated June 29, 1868.
The object of this invention is the construction of a



bleaching or lixiviating apparatus, with continuous circu-lation and pressure. The essential feature is the employ-ment of a lift, rotary, centrifugal, or other description o-pump, placed either outside or inside the bleaching vessel —Patent completed.

2086 G. H. Wilson, Sherwood-street, Golden-square, London. Watches, &c. Dated June 29, 1863.

This invention consists, first, of a new mode of, and mechanism for, winding: and, second, of a new mode of, and mechanism for, setting or adjusting the hands; and, third, of a new mode of, and mechanism for, adjustment to equalize the force of the mainspring, which mechanism also prevents overwinding. Reference to the drawing is to a full description of the invention.

2087 C. E. BROOMAN, Fleet-street. Manufacture of shawls, dc. (A communication). Dated June 29, 1868. This invention consists in a particular manufacture of shawls in imitation of embroidered or figured Indian shawls, which shawls can be made of the weight of ordinary French shawls and lighter than Indian shawls. For nary Frence snaws and ignier than indian shawls. For this purpose the patentee employs only one warp for the fringes for the ground, and to connect the wefts on the right side and on the reverse side, then he uses another and thicker warp which forms the design only, and is never employed in the body of the fabric. It is this colour warp working in a reverse manner to that of the wefts which is the chief feature of the new shawl, and which it the appearance of a figured Indian shawl .- Patent

2088 W. R. LAKE, Southampton-buildings, Chancer

2088 W. B. LAKE, Southampton-buildings, Chancery-lane. Apparatus for generating fand burning the vapour of naphtha. (A communication). Dated June 29, 1868. This invention relates to an apparatus for cooking and similar purposes, which is heated by burning gas or vapour produced from petroleum, naphtha, benzine, or other inflammable liquids, which gas is mingled with the vapour of water and with atmospheric air at the time of combustion.—Patent completed.

2089 F. J. Drechnler, St. John's Wood. Boilers and funaces, &c. Dated June 30, 1868.

The patentee uses a number of superposed heating surfaces proceeding from the furnace or flre, and carrying the heat through the same in a scrpentine or zig-zag course. The bottom of the furnace he would, in some cases, construct of an inverted funnel form, but the form must depend upon the particular use for which the same may be required. The door can be hinged so as to completely enclose the furnace or stove when for horticultural, domestic, or similar purposes, allowing the apparatus to assume the character of an open grate when desired, and he prefers to have a fuel feed-hole at top with a lid or cover, which may be made to fit into a trough containing sand-water, or other liquid, to hermetrically seal the same An extra chimney should be provided for the better carrying off smoke and gases, and such extra chimney should have its exit in the ordinary chimney at a point above the damper. There is much dotail.—Patent abandoned. doned.

2090 G. GLOVER, Pimlico. Apparatus for the combustion apphtha. Dated June 30, 1868.

of naphtha. Dated June 30, 1868.

In the burning of naphtha, benzole, and similar liquids, it is desirable to have a ready means of regulating the amount of wick exposed above the wick tube. For this purpose the inventor forms the outer tube capable of sliding on the wick tube, and of rising above that tube. When the wick tube is surrounded by another tube disass or other matter representing a candle, he forms the apparatus with a socket to admit of the lower portion of such outer tube sliding thereon to an extent corresponding with the extent of adjustment which may be desired at the upper portion thereof—Patent abandoned.

2091 G. BOWER, St. Neot's, Huntingdon. Boilers for

2091 G. Bower, St. Neot's, Huntingdon. Boilers for heating purposes. Dated June 30, 1868.

This invention consists in an improved construction of boiler for heating water for buildings, conservatories, and other purposer. The boiler is constructed of loose or independent cast-iron tubes, placed either vertically or horizontally, and fitting to each other by plain face joints so as to form water-tight junctions, the circulation being effected by arranging the ends of the tubes so that they communicate one with the other, without requiring circulating boxes or receptacles for the tubes. It is evident that a boiler of any magnitude may be readily constructed by bolting a number of these separate tubes together. The form of tube preferred is of a triangular section with cylindrical ends, but tubes of any other section may be adopted. These boilers may be enclosed in sheet-iron or cast-iron cases, or set in brickwork.—Patent completed.

Patent completed.

2092 J. RANALL and W. R. CRABB, Battersea. Carriage to be impelled by the manual action of passengers. Dated June 30, 1863.

This invention relates to the construction of a carriage capable of being propelled by a manual action of the passenger or passengers without the use of cranks, levers, or treadles, and consists, principally, in transmitting rotary motion to the driving axle by means of an endless chain, belt, or band passing round a toothed or grooved (or toothed and grooved) pulley keyed on the driving axle, and round a similar pulley attached to a disc or wheel provided with a handle or handles, and placed within easy reach of the passenger or passengers.—Patent abandoned.

2098 J. BLOMFIELD, Colchester. Sewing machines. Dated

ine 30, 1868.

The stands or tables for sewing machines should be The stands or tables for sewing machines should be made in motal, and they are to have three or more legs. Their rims or tops should be circular, or approximately circular, and a segment of a rim or top should be firmly affixed or be in one piece with each leg, and the regments are to be lapped and bolted together. In the rim and other parts glass may be inserted with the view to increase ornamental effect. The legs can, if desired, be brought together in the centre, and be secured by means of branching parts, on to which caps are fitted at top and bottom of such parts, screw bolts or nuts being used to tighten or draw these caps together, thus fastening the legs in positions. The working parts of the sewing machines, such as flywheel and the like, may be suitably connected to the legs or other part of the table or stand.—Patent completed.

2094 M. BERRO, Manchester, and O. Hopwood, and W.

ELAM, Liverpeol. Apparatus to be employed for numbering and printing tickets. Dated June 30, 1868.

The patentees claim a novel and peculiar arrangement and combination of mechanism described, or any slight modification thereof, whereby an arrangement of spirally composed type will be enabled to continuously print consecutive numbers or subject matter upon continuous length of paper, together with the arrangement of cutters for subdividing such continuous length of paper, as described, set forta, and fully illustrated in the drawings.

—Patent completed.

2095 J. H. BANES Kantaland.

described, set forta, and fully illustrated in the drawings.—Patent completed.

2995 J. H. Banks, Knutsford, Cheshire. Constructing buildings. Dated June 39, 1863.

That whereas, under ordinary circumstances, walls are built of wood, stone, brick, or other material of sufficient thickness and strength to bear and resist the weight and thrust of the floors and roof, the inventor, by the use of iron buttress standards, placed at defined distances apart, do merely relieve the walls of the weight and thrust, which standards have flanges formed upon them, so arranged that the spaces between one standard and another can be filled in with bearding, bricks, and bond timber, rubble, or any other material, as may be desired; and, further, that, upon the upper extremity of the standards, a shoe is formed to receive the end of roof principals, on one side of which shoe is formed of a separate plate, which manner of construction, allowing the woodwork to be belted tightly up to the side of the shoe, which is a part and parcel of the principal, thus making the attachment of the principal to the standard inthoroughly secure; and, further, the standard is provided with a projecting hook to receive brackets for supporting spouts, and a slot to receive the wall plates, which wall plate is used to tie the standards laterally to each other, as well as to receive the spars; and, further, the wall plate forms the transom of the windows, if desired. The bottom part of the standard is shaped as a bed plate (which may be botted down to a sill formed of wood, iron, stone, or brick, if necessary), and is further provided with a vertical flange, to which flange are botted joists that are sufficiently long to go across the building to be attached to the standard on to the opposite side; and, further, that instead of using iron boxes to receive the purlins, he uses iron back plates, which have this advantage, that they cenable him to attach the purlins to the purlins, he uses iron back plates, which have this advantage, that they cenable hi

2096 A. M. CLARK, Chancery-lane. Breech-loading fire-rms and cartridges. (A communication). Dated June 30,

2096 A. M. CLARK, Chancery-lane. Incon-locating prearms and carbridges. (A communication). Dated June 30,
1858.

This invention consists, first, in a mode of cocking the
gun during the act of loading. Second, in the employment of a spring striker for producing a more powerful
blow than can be obtained by a spring which is cocked
or put in tension by the hand without the aid of a lever.
Third, in so enclosing the striking parts as to prevent the
admission of dirt or matters which might impede their
action. Fourth, in obtaining a perfectly gas-tight joint
by means of a non-metallic cartridge of this invention.
Fifth, there is no cartridge case to be extracted after the
discharge. Sixth, the breech-closing and striking
mechanism is always preserved in a serviceable condition.
Seventh, the breech-closing plug is deprived of any part
requiring renewal from wear. Eighth, the breech-loading
firearms of this invention may be readily adapted for
firing and extracting metal cartridge cases. Ninth, in the
application in the latter case of an improved extractor for
withdrawing metallic cartridge cases, or cases with metal
ends. The invention is not fully described apart from
the drawings.—Patent completed.

2097 W. Daalish, Wellington Quay, Northumberland.

2097 W. Daglish, Wellington Quay, Northumberland. Kilm. Dated June 50, 1868.

This invention is not described apart from the drawings.

Patent completed.

2098 G. ALDER, Newcastle-on-Tyne. Screw propellers. Dated June 30, 1868.

Dated June 30, 1888.

This invention consists in imparting to the screw propeller a compound motion, consisting of a rotary motion with the shaft on which it is mounted, and also a rocking or sculling motion produced by continually changing the angle of the propeller blades with the axis of the longitudinal shaft. To this end the boss of the propeller, instead of being keyed firmly and immovably on the shaft, is connected therewith by a cross pin, on which it is capable of being made to rock while the shaft rotates. The rocking motion of the boss on its cross pin is effected by means of a crank or eccentric motion derived from the main driving shaft, and imparted to the boss or sleeve shaft, which is made to slide to and fro on the propeller shaft, and is connected by a pair of rods to the boss or arms of the propeller.—Patent completed.

2099 B. Ward. Newwastle-upon-Type. Machinery for

arms of the propeller.—Patent completed.

2099 R. Ward, Newcastle-upon-Tyne, Machinery for spinning or twisting tobacco. Dated July 1, 1885.

In forming rolls of tobacco twist the patentee employs reels so constructed that when the roll of tobacco twist has been formed upon it, the reel may be taken apart and the roll removed from it in the form required for sale. In the case of brown twist, or twist which does not require to be pressed, provision is made for tying and securing the roll before removing the reel; and, in the case of black twist requiring to be pressed, the reel is adapted to admit of the twist being pressed whilst upon the reel, the ends of the reel being capable of yielding to the pressure, and moving inwards, or towards each other, as the twist between them is consolidated. The end of the reel may have letters, or a pattern recessed into it, in order to mark, in a similar way, the roll which is pressed upon the reel.—Patent completed.

2100 J. Ward and W. S. Black, King's Lynn. Ma-

pressed upon the reel.—Patent completed.

2100 J. WARD and W. S. BLACK, King's Lynn. Machinery for twisting tobacco. Dated July 1, 1863.

The patentees claim, first, arranging machinery for twisting tobacco in such manner that a core of tobacco leaves, in connection with spinning or twisting apparatus, may be pieced or made up by a workman at a suitable table, and may then have covering leaves of tobacco applied to it, and lapped around it with a more rapid spiral, the amount of twist on the core and the length of the spiral of the covering leaves being under the control of the workman, and regulated by the amount by which

he checks the rotation of the core. Second, compressing a core of tobacco leaves by a reciprocating mallet or pressing instrument, at or near the spot at which covering leaves are applied to it. Third, the arranging machinery for twisting tobacco, substantially as described.—Patent expendent. completed.

2101 W. BROOKES, Chancery-lane. Rolary steam engines.
(A communication). Dated July 1, 1868.

This invention is not described apart from the drawings.

Patent completed.

2102 W. BROOKES, Chancery-lane. Electro-magnetic silvesy brakes. (A communication). Dated July 1, 1888. This invention is not described apart from the drawings. Patent completed.

2103 W. BROOKES, Chancery-lane. Meters for measuring ater, &c. (A communication). Dated July 1, 1868. This invention is not described apart from the drawings.

2104 Provisional protection has not been granted for this.

2105 C. F. CRAILSHEIM, Southampton-buildings, Chan-ery-lane. Bottles for efferescing liquids. Dated July 1,

The patentee claims, first, a bottle containing effervescing or gaseous wines or liquids constructed with two orifices one of which is provided with a syphon, substantially as set forth. Second, a stopper for champagne bottles, and other vessels attached to the neck of the same, an imade capable of being hermetically scaled and locked, substantially as set forth.—Patent completed.

2106 A. TAYLOR, Birmingham. Necktics or crasses.
Dated July 2, 1863.
These improvements consist in so arranging the tie or cravat that the parts that come together in the front shall be provided with worked or other eyeletted holes or apertures for receiving the shank of the improved fastener, which may be formed of bone, ivory, pearl, metal, or other suitable material, having an expanded or flat termination at its inner end, and so fashioned at the front end of the shank that a stud or other attachable ornament may be secured in, on, or otherwise attached to it.—Patent abandoned. Patent abandoned.

2107 A. ALEXANDER, Belvidere, Kent. Carriages and locomotive engines. Dated July 2, 1868.

The details of this invention are too voluminous to admit of our quoting them here.—Patent abandoned.

admit of our quoting them here.—Patent abandoned.

2108 L. Francis, New York. Compositions applicable to printing purposes. Dated July 2, 1868.

The nature of this invention consists, first, in combining glue and glycerine with or without saccharine matter to form a composition for printing purposes, other than printers inking rollers, where elasticity is required. The invention relates, in the second place, to a combination of glue and glycerine, with or without saccharine matter, with any of the metals, or their insoluble compounds, finely divided, or with the solutions of their soluble salts, for the purpose of manufacturing emery cloth, artificial homes, and stereotype plates, to be used by hand or by machinery, various forms of belts, wheels, for polishing, and for various purposes where an elastic composition is available.—Patent completed.

2109 H. H. HENSON, Parliament-street, Westminster. Rai'way wayyons and trucks. Dated July 2, 1868.

2109 H. H. HENSON, Parliament-street, Westminster. Rativary arapyons and trucks. Dated July 2, 1868. The patentee claims means whereby the body or superstructure of a railway waggon or truck is constructed separate from the under framing, and is so suspended or supported therefrom or thereby, or from or by parts fixed to the under framing, that the body shall be capable of more or less free end motion relative to, and independently of, the under framing.—Patent completed.

more or less free end motion relative to, and independently of, the under framing.—Patent completed.

2110 W. Dean and B. Andrew, Derby. Apparatus imployed for stopping the loom upon the breaking of the west turndord from the state. The improved machinery or apparatus is applicable to looms for weaving clastic webs, ribbons, fringes, or other narrow fabrics. In the improved machinery or apparatus a wire is used; at one or both selvages of each breadth of fabric made in the loom each such wire is secured to a rocking lever, at or near the centre of this lever, which lever has one of its ends inclined at its top side, and pointing inward towards the batten of the loom; the point end of the incline points slightly upwards at such times as the unbroken weft thread or threads press upon it, but when either weft thread is broken, the inclined end of the lever is depressed by its own weight, and, while so depressed, a reversely inclined piece of iron or other metal secured to the batten slides upon the incline of the rocking lever, thus elevating the outer end of the lever, which raises an arm secured to a rocking shaft, and on this rocking shaft is also secured a eatch lever, which takes into a catch, or slides by the side of a boss, or its equivalent, either of which is secured upon the hand rod, or its equivalent, there is the own, which throws the driving strap from one pulley to the other; the arm on the rocking shaft being raised, the catch lever will be thrown out of the catch, or clear of the boss on the hand rod, or its equivalent, leaving such hand rod, or its equivalent, free to be moved, so as to throw the driving strap from the fast pulley on to the loose pulley, and thus stop the foom. The rocking shaft which carries the lever and catch lever lies in bearings upon the lowerside of part of the front framing of the loom, and the hand rod, or its equivalent, leaving such hand rod, or its equivalent, every lies in bearings upon the lowerside of part of the front framing of the loom, and the hand rod, or its

moved clear of the above-mentioned caten of boss.—Fateus completed.

2111 J. D. PINFOLD, Rugby, Warwick, Apparatus for making bricks, tiles, &c. Dated July 2, 1868.

These improvements embrace the lubrication of the moulding oritices, and the pressing rollers of the apparatus (or some of them) and the surfaces (or some of them) of the compressing chamber or place where the squeezing takes place, with oil, water, steam, or other lubricant: also the construction of, and adaptation to the apparatus of, checks or scrapers, which may be at, to, or near to the oriflees, and of rollers in or partly forming the compression chamber, such checks, and the surface of such rollers, being of porous material, or semi-porous or non-parts of them, being movable and adjustable, if desired, to any dimensions required; also, when the compression chamber and die is formed with horizontal and vertical rollers, the adaptation of an adjustable or fixed upper, and an adjustable or fixed lower, plate or plates therein or thereof, lying generally horizontally, horizontal, or nearly



so. Further, the improvements embrace the construction of the compressing chamber, orifices, dies, rollers, and plates, wholly (in one or more places, as may be found convenient, of blue lias clay), Ransome's patent stone terra-cotta, wood, perforated or louvre fashload metal, on the notice of the notice of the property of the prope ierra-cotta, wood, perforsted or louvre fashioned metal, or other porous or semi-porous material, sqitably formed hold or receive lubricating matter if desirable; and with reference to cutting the expressed clay or material individual properties of the invention embraces the causing a folding cutter or divider to travel with the clay during the action of cutting or dividing, and so that it may be returned to its normal positions, all without stopping the sappeasing action; also the mechanically diving the carrying bands or rollers for receiving and carrying forward the clay as delivered from the ordices by or from the motion of a cutting wheel, such as the "Rugby" brick machines, including, also, application of friction arrangements, and of change wheels for varying speed. The invention comprises many other features, a description of which we cannot give space to here.)—Patent completed.

4112 J.E. POYNTER, Glasgow, and J. L. PATTERSON, Greenock. Manufacturing salipetre. Dated July 2, 1863
This invention has for its object the manufacture of salipetre directly, with ultimate recovery of the iodine and bromine, from kelp, seaweed, charcoal, or other residue of the decomposition of seaweeds by heat.—Patent

2113 E.J. SCOTT, Glasgow. Ornamenting boots and shoes.
pated July 2, 1868.
This invention consists in printing with enamel or japan
varials on the patent or enamelied leather.—Patent com-

pased.

2114 F. A. PAVEY, Peckham Ryc, Surrey. Marking bard for billiards, &c. Dated July 2, 1868.

The features of novelty which constitute this invention, consist, first, in so constructing marking boards so that the score cannot be set back, and thereby tampered with, and, second, that a considerably higher number can be scored than heretofore.—Patent abandoned.

2015 D, Hall, Winsford, Cheshire. Construction of furnaces. Dated July 2, 1868.

The improvements which constitute this invention relate more particularly to furnaces for salt pans, but may also be applied to steam boiler ond other furnaces generally. The object of the invention is in whole or in part to dispense with firebars and the ordinary grates, and to make provision for feeding the said furnaces with fust by mechanical appliances, and thus to save the manual labour consequent from the ordinary plan of construction and mode of feeding by a shovel, or other similar means.—Patent completed.

2114 IR Graggen Catashand Durham. Production of

2116 J. B. Gregson, Gateshead, Durham. Production of sulphate of lead. Dated July 2, 1863,
This invention consists in obtaining a sulphate of lead by decomposing a solution of chloride or muriate of lead by means of a solution, either of sulphate of soda, or of sulphate of magnesia, or of sulphate of iron, or by means of a mixture of sulphate of soda and sulphate of magnesia in solution—Patent abandoned.

in solution—Patent abandoned.

2017 E. PAVY, London-street, London. Treating and preparing certain vegetable and animal fibres to manufacture a new description of fabric or stuff applicable to various useful and descrative purposes. Dated July 2, 1868.

The patentoe claims, generally, the combination of processes or operations described for treating and preparing the fibres referred to, with the object of producing a sort of paper pulp, and of manufacturing from this pulp a felied paper, fabric, or stuff applicable to various useful and decorative purposes. And he claims, specially, submitting the fibres to what he calls the second were ling in caustic alkali after the gasoous chlorine. The details of the invention are voluminous—Patent completed.

of the invention are voluminous—Fatent completed.

2118 D. FENDER, Berwick-on-Tweed. Thrashing machines.
Dated July 2, 1868.

This invention consists, essentially, and particularly under one modification, in making four or other number of longitudinas, angular, or spiral rows of short tapered pins or teeth projecting nearly radially at intervals across the surface of the beating and stripping drum, by preference formed of malleable cast iron, in one piece, with their stripping bars screwed or otherwise secured to the drum at regular intervals round its circumference; these pins, teeth, projections, or rubbers (which may be of a round, elliptical or other sultable section), work within grooves or recesses of nearly the same depth as the height of the pins formed on a segmental part of the hollow casing round the drum close to and above or below the usual feeding rollers, according as the drum is driven up or down from them, the grooves having obtuse, angular, or curred radial ridges undulating round their sides or edges, by proference formed of projecting ribs cast on the inside surface of the segmental part, which is made to oscillate on a joint or axis near the feeding rollers, set at a proper distance from the pins or rubbers, to allow of the heads of the corm or crop entering and being carried round the grooves by the pins, so as to strip off the grain by rubbing on (the surface and edges of either or both sides of the radially redged grooves.—Patent abandoned.

2119 A. M. Clark, Chancery-lane. Barometers, &c. (A communication). Dated July 2, 1868.

ali P A. M. CLARK, Chancery-lane. Barometers, &c. (A (communication). Dated July 2, 1868.

The index does not indicate whether the pressure is stationary or on the increase or decrease, the object of the invention being to obtain this indication by adapting to barometers and other pressure gauges an additional part or solf-acting in-liteator to show whether the pressure is increasing or decreasing.—Patent completed.

2120 A. M. CLARE, Chancery-lane. Preparation of flax, temp, jule, 4c. (A communication). Dated July 2, 1868.
This invention consists in the production of threads from short staples instead of from the long fibros hitherto suployed.—Patent completed.

2121 A. F. ROBERTSON, Bedford-square, London. Carts.
Dated July 2, 1863.
This invention relates to devices for elevating the forward end of a laden cart when descending an incline, in order to relieve the back of the beast by throwing more of the load upon and behind the arle, and also to devices by which such apparatus is made to act in unison with a brake upon the wheels.—Patent completed.

2123 J. H. JOHNSON, Lincoln's Inn-fields. Shoes for the de. (A communication). Dated July 2, 1868.
This invention has for its object the more effectually

securing the shoes of horses and other animals to the foot, whereby the nails ordinarily employed for that purpose are dispensed with, and the shoe is better enabled to resist any shock or strain to which it may be subjected, and consists in interposing between the hoof of the animal and the shoe an adhesive substance, the base of which is either canotchouc or gutta percha, and which firmly unites the shoe to the foot.—Patent completed.

firmly unites the shoe to the foot.—Patent completed.

2123 J. H. JOINSON, Lincoln's Inn-fields. Construction of bridges. (A communication). Dated July 2, 1888.

This invention relates to a method of constructing bridges, whereby the temporary framework or scaffolding ordinarily employed to support the main structure during the progress of the work is dispensed with, and consists, mainly, in the use of two or more levers projected from the opposite sides of the spaces to be spanned, and meeting in the centre, each lover being composed of a series of superposed layers, and each layer extending a certain distance in advance of the one immediately below, thus increasing by so much the projection of the lover.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT.

Dated January 5, 1869.

23 H. A. Bonnevillo, Suckville-street, Piccadilly. A new and improved process for conting all sorts of urticles with gold, silver, and other metals or mixture of such metals as may be beaten into thin sheets or contings. (A communication).

metals as may be beaten into thin sheets or coatings. (A communication).

24 L. Hannart, Kinz-street, Clerkenwell, Mid llesex, Improvements in the manufacture of printers' type, numerals, and other characters and devices in metal or compounds of metal, such as embossing blocks and other ornamenting tools used by bookbinders; also crests, monograms, seals, endorsing stamps, and numbering, dating, and alphabetical wheels used in stampling and endorsing machines employed for various purposes.

25 S. Bateman, Asuiere, near Paris. Improvements in paddlewheels.

26 W. Prosser, Lancashire. Improvements in the purification and bleaching of oils, gums, and resins and spirits.

27 E. W. and J. Voce, Salford, Lancashire. Improvements in the construction of rotary fans.

28 E. Fox, Sheffield. Improvements in the manufacture of all descriptions of metallic iron and steel worked in paddling furnaces.

ing the same.

30 J. Balbirnic, Fernley-place, Sheffield. A new or improved apparatus for inhaling vapours, medicated air,

improved apparatus for inhaling vapours, medicated air, or gases.

31 J. H. Johnson, Lincoln's Inn-fields. Improvements in sowing machines applicable to other machines worked by foot power. (A communication).

32 A. Mason, Craven-street, Strand. Improvements in the distillation of bydrocarbon oils. (A communication).

33 G. Smith, Manchester. Improvements in transces for the consumption of smoke.

34 D. Nicoll, Cornhill, City. Improvements in the construction of clothing for male and fomale use, and in the method of manufacturing materials to be employed therein.

therein. 35 W. Dawes, Kingston-grove, Leeds. Improvements in

36 S. Remington, Southampton-buildings, Chancery-lane. Improvements in breech-loading firearms.
37 A. W.C. Williams, Bridgeport, Fairfield, Connecticut, U.S.A. Improvements in lawn mowers. (A communication)

tion).

38 J. Stovens, Southampton-buildings, Chancery-lane.
An improved machine for platting, tucking, or folding, and dividing linen and other textile fabrics.

Dated January 6, 1869.

39 H. L. Vallee, H. A. Dourlet, and A. M. H. Armand, Boulevart, Sebastopol, Paris. Improvements in the manufacture of artificial flowers and foliage from vegetable parchment.

Boulevart, Sebastopol, Paris. Improvements in the manufacture of artificial flowers and foliage from vegetable parchment.

40 J. S. Gibsorno, Liverpool. Improvements in mechanical telegraphs.

41 E. Robbins, Stibbington-street, Somers Town, Middlesex. Improvements in the manufacture of decorative and perforated or tubular casts, slabs, blecks, or other forms and in the application thereof to the construction of buildings and other purposes.

42 K. Walter, Wicklow. Improvements in the manufacture of sulphuric acid.

43 A. Tyler, Mark-lane, City. Improvements in articles known as bon-bons or co-sacks.

44 W. Pidding, Walcot-square, Surrey. Improvements in the method or methods of treating plants, shrubs, and vegetable productions, for the purpose of extracting, collecting, and preserving the aroma and volatile matter or essential oil yielded by them.

Dated January 7, 1869.

45 G. Eveleigh, Tredegar-road, Bow, Middlesex. Improvements in the manufacture and purification of gas for righting, and in the means of applying the same to heating purposes, parts of which improvements are also applicable to the purification of mineral oil.

46 J. Mansergh, Westminster Chambers, Westminster. Improvements in stonch traps.

47 J. F. Cooke, Camnon-street, City. Improvements in the manufacture of copying luk.

48 H. Davey, John-street, Adelphi, Middlesex. Improvements in apparatt for raising and injecting water, and for feeding boilers.

feeding boilers.

49 F. N. Gisborne, Wost Strand, Middlesex. Improvements in means or apparatus for giving motion to sewing and other machines.

ments in means or apparatus for giving motion to sewing and other machines.

50 F. R. A. Glover, Bury-street, Middlesex. Improvements in the means of, and apparatus for, letting down, weighing, and fishing ships anchors.

51 J. H. Johnson, Lincoln's Inn-flelds. Improvements in the preparation of concentrated food tablets or cakes. (A communication).

52 W. Webster, Dundee, Forfarshire. Improvements in treating and softening jute, hemp, flax, and other fibrous substances, and in the machinery or apparatus connected therewith.

53 J. J. Bodmer, Newport, Monmouthshire. Improvements in the manufacture of iron and steel.

54 H. G. Fairburn, Goswell-road, Middlesex. Improvements in machinery for compressing and solidifying coal,

clay, lignite, peat, and other analogous substances, appli-cable also to machinery employed for other purposes. 55 C. Kendall, Mile End, Middlesex. Improvements in apparatus and appliances for working railway brakes, and for effecting communications between the guard, driver, and passengers.

and passengers.

Dated January 8, 1868.

56 J. Mangnall, Glasgow. Improvements in apparatus for preparing coffee and other infusions.

57 W. Tatham, Vulcan Iron Works, Rochdale. Improvements in machines for preparing to be spun cotton, wool and other fibrous substances, and for the production of a web to be converted into felt and wadding, and for display appropriate.

and other fibrous substances, and for the production of a web to be converted into felt and wadding, and for similar purposes.

58 T. P. Lucas, Belmont, Bromley, Kent, and G. H. J. Holt, Sydenham, Kent. An improved method of exhibiting cartes de visite or other portraits or pictures.

59 J. Daglish, Dene House, Seaham Harbour, Durham. Improved apparatus for lubricating the axles of coal tube and other waggons running on rails or tramways.

60 R. Wigram, Leeds. Improvements in horse ploughs.

61 A. B. Brown, Cannon-street, City. Improvements in machinery for raising and conveying weights and conveying power, and in pumping engines suitable for actuating such machinery.

62 W. T. Waite, Salisbury-square, City. Improvements in the treatment of saccharine matters.

63 T. B. Sydserff, Ruchlaw, Haddingtonshire. A ballotvoiting apparatus.

64 J. Rodgers, Hereford-street, Sheffield. A saw-hardening furnace, steam holers and brewing pane, to consume its own snuke and sive fuel.

65 M. Wilkin, St. James-terrace, Paddington, Middlesex, un J. Chark, Cnipp nh un-terrace, Paddington, Middlesex, timprovements in railway brakes.

66 J. Henderson, Auchencairn, near Castle Douglas, North Britain. Improvements in the manufacture of iron and steel, and in furnaces to be used in such manufacture.

Dated January 9, 1868.

Dated January 9, 1868.

67 W. E. Gedge, Wellington-street, Strand. Improvements in the manufacture and in the closing of boxes for

ments in the manufacture and in the closing of boxes for preserving provisions. (A communication).

68 R. Legg, Owen's-row, Clerkenwell, Middlesex. Improvements in the application of steam as a motive power. 69 F. S. Thomas, City-road, Middlesex, Inventions of and improvements in the construction of railway passenger carriages, the carriages of railway locomotives, railway axies, railway buffers, railway girdles, and other matters connected with railway trains.

trains.

70 M. Saunders, Prince's End, Tipton, Staffordshire, and
H. Forrest, Oldbury, Worcestershire. Improvements in
refrigerators.

71 E. Gray, Sheffield. Improvements in the manufacture of plough coulters and other like articles.

72 T. Moore, Bridge-street, Southwark. Improvements
in rotary engines which may be used as pumps or water
meters.

72 T. Moore, Bridge-street, Southwark. Improvements in rotary engines which may be used as pumps or water meters.

Dated January 11, 1868.

73 A. Baumann, Cecil-street, Sirand. Improvements in the construction of hydraulic travelling cranes.

74 J. Holding, Manchester. Improvements in \*emples employed on looms for weaving.

75 F. N. Gisborne, West Strand. Middlosex, and H. Aliman, Amphilli-quare, Middlesex. Certain improved apparatus to be employed for signals on railway trains and for the like purposes.

76 J. Knowles, Droylsden, Lancashire. Improvements in the method of weaving terry, looped, or piled country panes, toilet covers, and other similar fabrics.

77 J. and J. Jordan, Liverpool. Improved means for propelling vessels.

78 T. A. Warrington, Carlton-road, Kentish Town, St. Pancras, Middlesex. Improvements in clips for the attachment of window blinds to their rollers.

79 J. B. Palmer, Handsworth, Staffordshire. Certain improvements relating to the sight protectors, burrel protectors, and muzzle stoppers of firearms.

80 J. Petrie, jun, Rochdale, Lancashire. Improvements in machinery or apparatus for washing wool and other fibrous materials.

81 W. H. Penning, Bishop's Stortford, Hertfordshire. A new system of signalling by compressed air.

82 C. W. Spong, Cliffton-road, Clapton Park, Middlesex. Improvements in the construction and operation of certain parts of railway and other carriages.

83 J. H. Johnson, Lincoln's Inn-fields. Improvements in the manufacture of boxes and other hollow articles from paper pulp, and in the unachinery or apparatus employed therein. (A communication).

84 F. C. Matthews, Great Driffield, Yorkshire. Improvements in treating Indian corn to obtain a new product therefrom applicable for use in brewing and distilling, au is as a food for cattle.

85 C. Newsone, Coventry, Warwickshire. Improvements in milk cans.

85 C. Newsone, Coventry, Warwickshire. Improve-ments in milk cans.

NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," January 12, 1869. 2834 J. Jeavons and C. Martin. Manufacture of iron for plating vessels.
2680 J. M. Hunter. Apparatus for effecting aerial pro-

plating vessure.

2680 J. M. Hunter. Apparatus.

2685 S. Newton. Swing door hinge.

2685 S. Newton. Swing door hinge.

2693 W. E. Gedge. Apparatus for warding off leaves and other matters likely to clog the working of turbines.

(A communication).

2696 J. C. Martin. Manufacture of gelatine.

2702 T. G. F. Dolby. Construction of valves.

2704 W. R. Lake. Looms for weaving. (A communication).



2734 J. Parker. Apparatus for obtaining motive power for engines by means of a combination of steam and air. 2737 J. Pickering. Apparatus for raising and lowering weights

2737 J. Pickering. Apparatus for raising and lowering weights.
2740 I. L. Pulvermacher. Producing electric currents.
2741 J. Sloper. Apparatus for perforating cardboard.
2744 T. Wilson. Breech-loading firearms.
2750 U. A. Masselon. Kilns for burning bricks.
2752 G. Davies. Meter for water. (A communication).
2759 C. Holland. Compositions for the production of artificial stones. (A communication).
2761 J. Jones. Construction of furnaces.
2768 E. Cottam. Rolling and shaping iron.
2770 T. E. Clarke. Open fireplaces.
2773 E. Johnson. Ornamentation of muffs.
2780 A. V. Newton. Pumps. (A communication).
2784 A. A. Lejeune. Manufacture of colours.
2794 A. Cruls. Manufacture of cement.
2788 B. Dobson and W. Slater. Wood-cutting machinery.

chinery. 2805 G. Bischof. Separating copper from its solutions. 2808 G. Bower and W. Hollinshead. Gas engines. 2809 M. Henry. Apparatus for weighing. (A commu-

nication).
2847 J. Orrin and T. Geer. Apparatus for cutting the

uges of DOOKS. 2848 J. Horrocks. Looms for weaving. 2854 A. M. Clark. Electro-magnets. (A communica-

tion).

2893 B. Dickinson. Treating the leaves of the tea plant.
2894 B. Dickinson. Withering the leaves of plants.
3008 J. D. Scally. Apparatus for filling casks.
3049 H. Steffanson. Sawing wood.
3164 H. A. Archereau. Apparatus for obtaining heat.
3149 W. Lorberg. Treating cotton.
3150 H. Hudson. Stopping of railway trains.
3534 C. Descat and H. Guillaume. Fixing colours on textile fabrics.
3535 A. V. Newton. Sewing needles. (A communication).

3939 A. V. Alverton tion).
3644 N. West and R. Gibson. Preservation from cor-rosion of rudder pins.
3881 H. G. Thompson. Manufacture of carpets.
3900 H. T. Vanner and E. Prest. Currying leather. (A communication).
3932 H. G. Thompson. Manufacture of figured carpets.

3923 H. G. Thompson. Manufacture of figured carpets, 3950 W. R. Lake. Machine for pegging boots. (A com-

3976 H. A. Bonneville. Drying malt, &c. (A communication).

nication).

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.
Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application. office, particulars in writing of the objection to the application.

# PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

104 A. H. Hart 109 R. T. Sutton 122 C. G. Johnson 137 E. M. Boxer 139 C. Moriarty 43 H. D. P. Cunningham 58 H. N. Penrice 92 T. A. Blakely and J. Vavasseur 94 C. Bartholomew 100 F. J. King 294 L. Sterne

## PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

46 J. Tatham 59 C. W. Siemens 60 J. Smith and S. Well-

77 W. H. Preece 81 T. Ramsay 82 H. Charlton 138 W. L. Winans

#### LIST OF SPECIFICATIONS PUBLISHED For the week ending January 9, 1869.

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1481	0	*	169	1 1	1 2	1741	1	2	1790	0	4	1818	0	4	1846	0	4
1601	2	4	169	93	) 8	1742	0	8	1791	0	4	1819	0	4	1847	0	4
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1644	0	(	169	8	10	1745	0	6	1795	0	8	1822	9	4	1852	0	4
1648	0	10	170	)1 1	. 4	1746	0	8	1797	0		1828		4	1854	0	4
1650	0	10	170	)4 (	) 8	1750	0	8	1798	0	4	1824	0	4	1855	0	4
1661	5	2	170	9 (	10	1751	0	8	1799	0	4	182	0	4	1857	0	4
1665	0	8	17	10	) 8	1755	0	8	1801	0	4	1827	0		1858	0	4
1667	1	4	17	11 (	) 8	1759	0	8	1802	0		1830		4	1860	0	4
1672	1	8	17	15 (	) 8	1763	0	8	1804	0	4	1832	0		1861	0	4
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1677	1	4	175	26		1780			1807			1837			1866		4
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#### LIST OF SEALED PATENTS.

Sealed January 8, 1869.

2172 M. Bebro 2179 H. H. Doty 2185 W. L. G. Wright 2186 E. T. Hughes 2190 J. D. Churchill 2199 C. E. Brooman 2201 E. Edwards 2246 G. Woulton 2355 A. V. Newton 2379 A. V. Newton 2486 W. E. Newton 2589 A. Clark 3138 W. R. Lake 3345 R. W. Beckley 3371 J. Taylor 3495 W. R. Lake 2246 G. Moulton 2342 A. V. Newton

#### Sealed January 12, 1869.

2204 G. B. Puricelli 2209 G., G. W., and J. Betjemann 2210 W. R. Lake J. Bastow J. Galloway and H. Holt Thompson and J. G. Ingram

2228 C. de Bergue and J.
C. Haddan

2233 J. Bonnall

2235 W. Turner 2253 W. J. C. Muir 2252 W. J. C. Muir 2253 C. J. Galloway and C. H. Holt 2292 A. M. Clark

2282 W. H. and A. M. Bates and H. Faulk ner 2328 G. Smith 2341 J. Brigham and R. Bickerton 2347 A

Bickerton
2347 A. M. Clark
2357 A. M. Clark
2360 W. Lewis
2476 W. E. Newton
2477 G. Leach
2562 B. Hunt
3161 W. R. Lake
3192 W. E. Newton
3336 J. H. Bertie
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### MECHANICS' MAGAZINE.

LONDON: FRIDAY, JANUARY 22, 1869.

#### PROFESSOR TYNDALL ON CHEMICAL RAYS.

AST Friday evening, at the Royal Institu-tion, Dr. John Tyndall, F.R.S., delivered a lecture upon "Chemical Rays and Molecules," in the presence of an excessively large audience. He said that two or three months ago, while trying some experiments with a compound vapour enclosed in a glass tube, he had occasion to observe the effects of the passage of a powerful beam of light through the vapour. A slight cloud then appeared, which gave him some trouble, because it made him think it possible that in some previous experiments with radiant heat he had been led to ascribe to true vapour absorptive phenomena which in reality were caused by the cloudiness. A little further examination proved that the beam of light itself caused the formation of the cloud. The fact was that the nitrite of amylvapour in the tube was decomposed by the action of the luminous beam into small liquid spherules. He then repeated the experiment by first passing some of the air of the theatre through cotton wool, in order to filter out the dirt. Next, it was sent through a U-tube filled with powdered marble and caustic potash, to absorb the carbonic acid. Lastly it was dried by means of another U-tube Lastly, containing powdered glass and sulphuric acid. The air thus purified was then allowed to bubble through a little nitrite of amyl contained in a little Woulfe's bottle made of a test tube. Afterwards, the pure air charged with vapour was admitted into the great experimental tube, which was 5ft. 6in. in length, and had been previously exhausted of air through one of its stopcocks. This tube was fitted with transparent ends composed of flat discs of glass. When a brilliant conical flat discs of glass. beam from the lamp was sent along the axis of the tdbe, a bright cloud quickly formed at the end nearest the light. Professor Tyndall said that the energy of the waves was absorbed by the first length of vapour they encountered; consequently, they had no power left to set up decomposition at the further end of the tube. He then reversed the position of the tube by putting the transparent end nearest to the light, when a cloud was formed there also. Next, he charged the tube with nitrite of butyl mixed with hydrochloric acid, and upon sending the beam through it, as in the previous experiments, a fine blue colour appeared in the tube, equal to that of the finest sky of Italy. Gradually, the blue gave place to luminous cloud, which became more and more brilliant, and diffused a certain amount of white light through the whole of the theatre.

Professor Tyndall explained that when the particles of the vapour are excessively small, they probably can stop no light; but as they grow larger, they are able to stop the little waves before they stop the big ones. Now, as the blue are the shortest of the visible rays of the spectrum, these appear, therefore, to be reflected before any of the others, and afterwards the luminous rays are intercepted. The causes of the blue colour of the sky, and of its polarization, have always been standing riddles to meteorologists, but he thought that if the same conditions exist in the atmosphere as in his experimental tube, both phenomena were explained. The light emitted from the blue cloud was polarized, as

The lecturer then sent a parallel beam from the lamp, first through a large Nicol's prism, and then along the axis of the experimental tube, with its blue cloud. The cloud then emitted light horizontally, but not in a vertical or downward direction. In fact, it proved to be, virtually, a second Nicol's prism.

The lecturer said that the formation of excessively fine particles in the atmosphere would be sufficient to account both for the light of the sky and its polarization. But the subject is still beset with many difficulties, especially that of the polarizing angle.

#### MANUFACTURE OF CAPS AND CARTRIDGES.

No. I.

THE power that a percussion cap possesses of communicating explosion to a charge of gunpowder, is undoubtedly due to the presence of a certain proportion of detonating or fulminating ingredient. In spite of their great and obviously dangerous character, the preparation of fulminates has always had considerable attraction for chemists and experimentalists, and since the invention of the modern description of firearms, in which the old flint and steel have been abandoned, fulminating powder has been manufactured upon a very extensive scale. In the present and succeeding articles, we shall proceed to give some description of the various processes necessary to prepare that material, and also of the operations attendant upon the manufacture of percussion caps and cartridges, as carried on in the important establishments of M. Gevelot. One of these is situated in the Rue Notre-Dame-des-Victoires, not far from the Bourse, in Paris; a second in the Rue Amelot; and the third at Moulineaux, upon the left bank of the river Seine. The first of these may be regarded as the principal office or head quarters; that in the Rue Amelot is occupied by 400 women, who are charged with the preparation exclusively of the envelopes for war cartridges. It is in the last mentioned premises, situated at Moulineaux, near the bridge of Billancourt, where those operations involving danger to the inmates are carried on. Here the fulminating powder is prepared, the caps and cartridges for sporting purposes manufactured, and those for war filled and completed ready for their mission of destruction and death. Over 1,500 persons, including women and children, are employed at the establishment at Moulineaux, which is divided into two principal parts. One of divided into two principal parts. these is appropriated to the reception of the necessary machinery, and the other to the smaller apparatus and utensils employed in the manufacture.

It is not an easy task to trace the origin and gradual development of the whole tribe of fulminates. Probably, they were, in the first instance, the production of some chance experiment, having a totally different object in view. There is no question but that some of the old alchemists, in their indefatigable and unavailing searches in quest of the philosopher's stone, or the elixir vitæ, stumbled upon numerous detonating compounds. As these, however, possessed no interest for them, apart from their all-absorbing studies, they were in all probability disregarded, and, in many instances, care taken that they should not turn up again in future experiments. About 200 years ago, a chemist of the name of Bailden, gave a recipe for the composition of a fulminating powder, and there is a record in L'Academie Royale of the result of the labours of Lemery in the same direction, particularly with reference to fulminating gold. From the "Collection of Breslau," we find the first notice of the effect of this explosive substance. It is there mentioned that its

simultaneous end of both the mortar and the chemist. Full details of the method of pre-paring fulminate of gold are given in the chemical dictionary of Macquer, where are recorded the experiments of Etmuler, Hoffmann, Bergmann, and Beaumé. The metal should be first dissolved in aqua regia, composed of spirit of nitre and salammoniac, and then precipitated by the addition of a proper quantity of any fixed alkali. The precipitate is of a yellow colour inclined to red, and, when washed and dried, constitutes fulminating gold. The other precious metal is also endowed with the faculty of assuming similarly dangerous and destructive properties as its more noble fellow. Fulminating silver has been long known, and equally dreaded by those concerned in its preparation. The celebrated chemist, Berthollet, towards the end of the last century, investigated this perilous compound with considerable ability and pertinacity, and procured it by the following formula. Dissolve fine silver in nitric acid; precipitate the solution by adding lime water; decant, and expose to the air for three days. After that period, treat the pre-cipitate with fumes of sal ammoniac, when it will assume the form of a black powder. This dried by exposure to the air is fulminating silver. It is said that another of these extraordinary compounds, namely, the fulminate of mercury, was discovered in 1775, by Bayen, but there are no written records left of the discovery. Macquer, indeed, gave the name of fulminating powder to a mixture, composed of three parts of nitre, two of alkali, two of tartar, and one of sulphur. But that this was not a true fulminate is easily demonstrated by the circumstance that it required an elevation of temperature to cause it to explode, whereas the genuine article demands nothing beyond a smart blow, and sometimes not even that. Towards the close of the last century, Fourcray, Vanquelin, and the well-known Berthollet especially, turned their attention to applying these fulminating preparations to effecting the discharge of firearms. Chlorate of potash was also experimented upon with the same intention, but the blowing up of the powder mills at Essonne, in which Berthollet carried on his experiments, acted rather as a damper upon the zeal of those who advocated its employment.

It was reserved for Howart, in the year 1800, to determine accurately the composition and physical properties of fulminate of mercury, which, for some time subsequently, was known as Howart's quicksilver. About this time, a Scotch gunsmith took out a patent for a gun, in which the flint was replaced by a hammer, which acted upon a fulminating substance, and so communicated the explosion to the charge. Some of these arms were imported into France. Ten years afterwards, a M. Pauly patented the first French percussion gun. It was double-barrelled, breechloading, and the cartridge carried its own priming of fulminate. Upon pressing the trigger, a small iron rod was set in motion, which struck the priming, and exploded the cartridge. In addition to many imperfec-tions, the force of the explosion of the priming often caused both barrels to be discharged simultaneously, to the great annoyance and inconvenience of the soldier or sportsman. After the year 1808, more than a couple of hundred patents for percussion guns were taken out and handed over to gunsmiths, who were particularly careful to conceal the nature and composition of their respective fulminates. The first priming pieces were in the shape of little bullets covered with wax and varnish, which were placed in a small hollow or pan, and struck with a percussor or hammer. effect of the explosion was to produce a considerable dispersion of the wax and varnish, emitted from the blue cloud was polarized, as could be proved by examining it with a crystal of tourmaline. Nay, more; it could be made to act in a very peculiar manner as a Nicol's The mixture exploded, and there was a fulminate, but they were found to be too



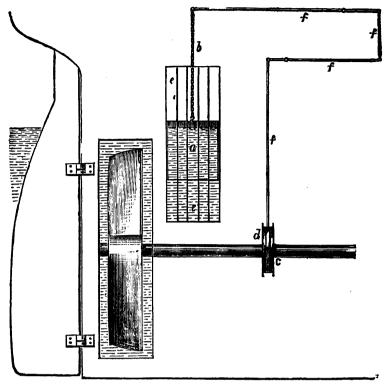
fragile, and also difficult of manipulation. All these attempts proved failures, and were supplanted by the invention of the percussion cap by Egg. It was imported into France by a gunsmith named Deboubert. A French gunsmith, Prélat, claims to have invented the percussion cap anterior to Egg. He patented and applied them in 1819 to what he was pleased to call his thunder gun. It was not until after the experiments of Charoy and Bruneel, towards the year 1840, that the French army definitely adopted the large copper cap, slightly conical, with a flat rim, in which the fulminating powder was secured by a varnish of gum-lac. The invention, however, was adopted nearly twenty years previously for guns intended for sporting purposes, the new ones being made upon that system, and the old ones converted to it. The clder M. Gevelot was the principal promoter in France of this new branch of industrial manufacture, and, in 1820, he added it to the manufacture he already carried on of arms and military equipments.

To be the first to carry on the preparation of a material so dangerous in its nature as to imperil the safety of those who are concerned in it, requires a large share of courage and resolution. It might justly have been argued that, if these detonating substances had been found so exceedingly unsafe as to cause the death of those who merely experimented upon them, and who were likely to be protected by every means that their science and experience could suggest, what would be the results when they came to be handled by careless and inexperienced workmen? No doubt accidents have arisen, but it will be seen, in the course of our narrative, that where proper and stringent precautions are taken, they are not more frequent than those that happen under circumstances infinitely more favourable, and, in fact, do not surpass the number that may be reasonably anticipated in a world of chance. M. Barruel, assistant to M. Thénard at the Faculté des Sciences, in the year 1800, lost his right arm by an explosion of fulminate. Some years afterwards, M. Bellot, a distinguished scholar of l'Ecole Polytechnique, suffered a similar mutilation, and an artisan was killed upon the spot by the explosion of the damp salt which he had slightly touched with an iron point. Un-daunted by the disastrous precedent that cast an ominous shadow over his intended manu-facture, M. Gevelot started the work upon his own premises, and the contents of our succeeding articles will be the best proof of the well merited success that rewarded his courage and perseverance.

## REGULATING THE VELOCITY OF THE SCREW PROPELLER.

In a gale of wind, the stern of a ship is lifted high out of the water, and along with it the screw propeller, many times every minute. It is at these moments the great danger exists of breaking the blade of the propeller, or of twisting off the main shaft, as has been the case with many screw ships of late. The public at large have very little knowledge of the great marginal velocity of the screw which is necessary to propel the ship at ten or twelve knots an hour; 45 or 50 miles an hour is the ordinary screw speed, but when the stern is lifted out of the water, and the resistance removed from the blades, the screw revolves at a speed equal to one or two hundred miles an hour. True, this is but for a moment, yet it has proved to be long enough to send some of our best ships to the bottom, and this unsatisfactory condition of matters arises from the absence of any efficient means of checking the increased velocity of the screw as it rises out of the water in rough weather. To meet the requirements of the case, Messrs. F. and C. Hancock, of Dudley, have invented the apparent

### HANCOCK'S SCREW PROPELLER REGULATOR.



ratus for regulating the velocity of the screw shown in the annexed engraving. Messrs. Hancock will be well remembered by our readers as the inventors of a screw propeller, which was described in our issue for September 18 last year, and which upon trial gave some remarkably favourable results.

In the present instance, in order to maintain the screw as near as possible at an uniform velocity in all weathers, Messrs. Hancock fix to one or both sides of the stern of a screw vessel the flat floating buoy a, which is wedge-shaped in plan, the thin edge being towards the bow of the vessel and close to the side. This buoy is held in position by strong V-shaped bars of iron e; one portion of these bars is attached to the ship, and another portion projects from the side just far enough to receive the buoy. The buoy is braced with iron to work into the V-shaped bars, and in this position the buoy is allowed to rise and fall freely, but is held firmly from any side action, easily moving up and down along the back and front V slides. The buoy is made of such a specific gravity as that it only just floats. This is the arrangement which is used on vessels already built, but in new ships a recess will be formed in the stern, which will enable the buoy to rise and fall flush with the run aft. To the buoy is attached a chain b, and on the main shaft is fitted a drum d. On this drum is a brake strap, and in connection with the brake is a compound lever ff, which is connected at the other end with the chain which is attached to the buoy. By this means, the velocity of the screw is regulated, and kept from any injurious speeds.

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largest and smallest screws can, therefore, be checked and regulated by this self-acting buoy, which does not require anyone to control it. Every time the screw rises out of the water, the buoy sinks down in its slides, and brings its own weight to bear, through the compound levers, on the brake strap; thus, in a moment, regulating the velocity of the screw. One important feature in this invention is that it acts momentarily, which is so essential to the safety of the ship; and the screw, being immediately disengaged from the brake, has the full power of the engine upon it at the time it is most required to propel the ship forward out of the trough of the sea. This cannot be the case when we rely upon the cutting off the steam in checking the sudden increased velocity of the screw, inasmuch as the steam is often cut off, leaving one cylinder full, which exerts its whole power on the screw at the time the screw is high out of the water. Consequently, the screw is whirled round at a frightful velocity, making everything tremble and vibrate throughout the ship.

All the dangers that attend a screw ship in a gale of wind, beyond those incidental to a sailing vessel, are therefore done away with by this simple arrangement of the floating buoy. There are other advantages arising out of this invention beyond the increased safety afforded by it to the ship. There is, for instance, a great saving of fuel, for every time the screw gets an increased velocity from being lifted out of the water, there is a great waste of steam, and consequently of coal, and very little propulsion on the ship. This is one great reason why a screw ship labours so much in a strong gale of wind, and makes so little progress. The steam is often out of the cylinders when the screw is deeply immersed, owing to the inefficient system of cutting off the steam, which often leaves the ship a rolling log in the trough of the sea. This would, of course, be obviated with the brake action afforded by Messrs. Hancock's apparatus, which, from its practical merits, will doubtless come into use in all sea-going vessel driven by the screw propeller.

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#### KING'S COLLEGE.

N the evening of yesterday week, the halls, class rooms, and other apartments of King's College presented an unwonted appearance of gaiety and animation, which contrasted in a marked manner with their usual staid and grave appearance. The sombre academical garb gave place to all the variegated hues of ladies' dresses, and the voices of the lecturers were superseded by sounds of music and song. The occasion was a soirée upon a scale of considerable magnitude, which was given by the principal —the Rev. Dr. Barry—and academical staff of the College. Such an event had not taken place for about ten years previously, and its success was complete. In the great hall and the two adjoining drawing rooms were placed numerous works of art, the walls being hung with valuable paintings by Millais, Frith, Cattermole, O'Neil, Stanfield, Rosa Bonheur, Ward, Hook, and other eminent artists. Her Majesty lent an interesting collection of weapons, including the sword of Charles I., left at the house in which he passed the night previous to the battle of Naseby. Near it was a sword which once belonged to Hampden, and which is said to have been wrought by Cellini. A number of specimens of silver electro-plate, glass, and china ware were lent by leading manufacturers in those several branches of art. In another apartment, photographic illustrations were given by the the oxy-hydrogen microscope, by Mr. Close by, Gassiot's vacuum G. Dawson. tubes were exhibited, and a large induction

coil was at work.
Sir Charles Wheatstone kindly exhibited various magnetic and electric apparatus, his brilliant coronet of vacuum tubes attracting especial attention. In another room close by, we found some exceedingly interesting experiments in the way of cohesion figures, which were produced by dropping various oils upon the surface of water. The lime light, a magnifier, and a reflector, threw these figures on to a screen, where their vagaries produced considerable amusement, although the smell of some of the oils did not invite a protracted visit from the ladies. The Microscopical Society sent a number of microscopes well supplied with interesting subjects. In another apartment, the vibrations of air in organ pipes were presented to the eye by means of gas flames reflected in a revolving mirror; the flames themselves were also shown to be musical. The novelty of the evening, however, was the zirconium light of M. Caron, which was then introduced for the first time into England. The light is somewhat similar to the lime light, but exhibits a more intense brilliancy. The band of the Grenadier Guards enlivened the evening with the performance of an excellent selection of instrumental music, whilst at intervals the vocal music of the Civil Service Musical Society was listened to with pleasure in the great hall. The soirce was most successful, and reflected great credit upon the committee of management, which consisted of the following gentlemen:—The Rev. Dr. Barry, principal; the Rev. G. F. Maclear, head master of the school; Professor Adams, Professor Bentley, Professor Cutter, Professor Cutte Delamotte, Professor Grey, Professor Miller, Professor Mariette, and Mr. J. W. Cunningham, secretary. The doors were thrown open at eight o'clock, and from that hour until nearly twelve, a ceaseless stream of visitors continued to circulate through the various apartments. We believe there were various apartments. three and four thousand persons between present during the evening.

#### METROPOLITAN IMPROVEMENTS.

IF anyone is desirous of knowing what is I going on in and around this busy metropolis in the way of improvement without the majesty on May 13 last.

The new streets next come in for notice.

him to read the annual report of the Metropolitan Board of Works. Here he will find the whole metropolis laid open before him with reference to what is being done to improve its drainage, to purify its river, to utilize its sewage, to improve its streets, so as to facilitate the swelling traffic of an over-grown city, to reduce its bills of mortality, and, in short, to render it clean, sweet, healthy, and accessible. The annual report for 1867-8, which has recently reached us, is full of interest, and treats, as usual, upon a great variety of subjects. We first find the great variety of subjects. We first find the Board dealing with the main drainage of the metropolis, and here we are informed-which, by the way, we already knew-that with the exception of portions of the northern low level sewer and the pumping station at Abbey Mills, the whole of the works comprehended in the main drainage scheme have been completed and in full operation for the past three years. The area drained by the Board's main and branch sewers is about 117 square miles, and the length of sewers constructed is about 82 miles. The natural effect of the main drainage works has been to secure in a still higher degree than heretofore the purity of the Thames within the limits of the metropolis. The marked increase of fish in this portion of the river, and the absence of offensiveness during the summer, which has been remarkable for the long continuance of a very high temperature and the small amount of rainfall, are clear proofs of its improved state, and give a guarantee that there will be no return to those conditions which in the year 1858 gave rise to such well-grounded alarm in relation to the health of London. Several matters of detail still remain to be carried out in connection with the purification of the river, such as preventing the discharge of offensive matters from gas works and manufactories into the river, and these are receiving the attention of the Board. With regard to the utilization of the sewage, the Board have had some operations carried out during the last few years, the results of which have tended to confirm the previouslyexpressed opinion of the Board with regard to the value of sewage as a fertilizer of the soil. A sample of wheat was sent to the Board grown on land which bore a wheat crop last season, and produced by means of unexhausted manure remaining on the land after 4,000 tons of sewage per acre had been applied to it last year, the same land having produced 71 tons of grass per acre last sea-

Turning to the Thames Embankment, both north and south, we have a very lengthy report, the substance of which may be given in a few lines. Generally, we may state that the first portion on the north side, extending from Westminster Bridge to Waterloo Bridge, has been completed and opened, as has also the second portion, from Waterloo Bridge to the eastern end of the Inner Temple Gardens. With regard to the third portion, between the Temple and Blackfriars Bridge, there has been considerable delay in consequence of negotiations with the Metropolitan District Railway Company, but it has not been without corresponding advantages. A recent hindrance—to which the report does not refer, being dated June 30, 1868—was the giving way of the piling, by which the works became flooded. The Board goes on to observe that while, on the one hand, a large saving in the cost of construction will be effected, on the other the continuation of the Embankment in a solid form, with a roadway of 100ft., will give to the work an uniformity from which an open viaduct would have detracted. embankment on the south side of the Thames extends from Westminster Bridge to Gunhouse-alley, Vauxhall, about 4,300ft. About 81 acres of the ground forms the site of the proposed new St. Thomas's Hospital, the

The chief of these is the new street from Blackfriars-bridge to the Mansion House. The street will extend from the termination of the northern embankment at Blackfriarsbridge to the Mansion House, and the total length will be 3,450ft., and its width 70ft. As the line taken by the street passes through some of the old City burial-grounds, it became necessary to make arrangements for the removal and reinterment of the coffins and human remains. A contract has been entered into to remove the remains and re-inter them in the Great Northern Cemetery for the sum of £950. The claims for property required were £2,526,682 19s. 1d., which were settled for £1,938,217 18s. Since the date of the Board's last report, the Middle-row improvement has been completed. The block of buildings forming the north side of Middle-The block of row, and which tended so much to impede the traffic in Holborn, has been removed, and the ground thus cleared thrown into the public way. The new roadway and footway were opened on December 24, 1867. roadway now averages 56ft. in width, with a footway 16ft. wide on the north side, and 20ft. on the south side of the road. The object of the Whitechapel improvement is to form a new street, extending from Backchurch-lane to Leman-street, with a view to affording an improved means of communication between Whitechapel and the Commercial-road. During the past year, the acquisition of the properties required for this improvement has been satisfactorily proceeded with, and the demolition of the buildings is now rapidly going on. The estimated net cost of forming the street is £115,364.

Mindful of the necessity of open air recreation as a means of health, the Board have not neglected the parks which they are carrying out. The demand for building ground near the metropolis, arising from its rapid exten-sion and the removal of dwellings, chiefly those of the poor, which has become necessary to carry out the extensive railway and other public works in progress, gives an importance to the subject of open spaces which has never before attached to it. The Board are fully alive to the necessity, which springs out of rapid extension of the metropolis, of securing absolutely as much open space as shall provide for the inhabitants of London and its suburbs the proper means of health and recreation. Finsbury and Southwark Parks will be completed during the ensuing spring, and will shortly after be available for the use of the public. The area of Finsbury Park is 116 acres, and Southwark 63 acres, at a cost respectively of £56,869 and £55,160.

The arrangements of the Board for the protection of life and property from fire throughout the area under their jurisdiction, are advancing rapidly towards completion. Two years and a-half had clapsed, at the date of the report, since the Metropolitan Fire Brigade Act came into operation, and a comparison of the means now at command for extinguishing fires with those which were in existence when the Board assumed the duty, will suffice to show the progress and extension which have been effected. The number of stations handed over to the Board by the late London Fire Engine establishment was 17, exclusive of two floating engines on the river. There are now 44 stations on land and 3 on the river. The number of men forming the staff of the brigade when it came under the jurisdiction of the Board was 130; the present number is 314. The number of fires attended was 1,492, and 2,090 chimney fires; and as regards the latter, in 1,528 cases, penalties were imposed by magistrates.

Amongst the minor, although equally important, details of the Board's work, we may first refer to the gas supply of the metropolis. This important subject has again, during the past year, been much under the consideration

price not exceeding 3s. 9d. per 1,000 cubic feet for common gas of an illuminating power of not less than sixteen candles, subject to revision every year by the Board of Trade.

Next, we have the question of improvements by local boards. It appears that the Board have, upon the application of several local have, upon the application of several local authorities, during the past year, agreed to contribute to the cost of widening various thoroughfares in the City of London and other parts of the metropolis. The estimated cost of these improvements was £99,797 5s., and the Board agreed to contribute £33,123 2s. 6d. Attention has been given to the storage of petroleum. A bill was intro-duced by Her Majesty's Government during the past session to extend the provisions of the Petroleum Act of 1862, which was passed, and the Board trust that the effect of the measure will be to promote a better observ-ance of the law on the part of the dealers in petroleum and other substances of a similar nature.

The financial transactions of the Board are of course, of considerable magnitude, and in keeping with their other operations. At the date of the last report an amount of £15,843 18s. 5d. remained due to the Board from the Bank of London; this sum has since been paid, together with £1,658 19s. 11d. for interest. During the past year loans have been paid off to the amount of £261,900, but new loans have been entered into amounting to £1,180,000. The total indebtedness of the Board at the present time is £6,903,366 13s. 4d. Since its constitution, the Board has sanctioned the formation of upwards of 1,300 streets, the applications during the past year having been 288, of which 202 were granted, and 86 refused. We have frequently called attention to the re-naming of streets and the renumbering of houses-matters which have proved highly satisfactory to the public. It appears that during the year orders have been transmitted for re-numbering streets, by which means 466 subsidiary names have been abolished, and precision of reference much simplified, to the great convenience of the public. A very large number of streets still needs revision as to their naming and numbering, and as the requisite operations are necessarily slow, and great accuracy is required, it will probably be some time before the current demands are satisfied.

The Metropolitan Board of Works had been constituted twelve years at the date of their report-which, by the way, we should like to see issued earlier than six months after date-and during that time they have expended large sums in carrying out the objects contemplated by the Local Management Act of 1855, and various other statutes passed in subsequent years, under which largely-extended duties have devolved upon them, and these sums have been uniformly raised by local taxation on the occupiers of property within the metropolitan area, the only exceptions being the coal and wine duties, the Government contribution of £10,000 per annum, and the annual amount received from Government contribution of £10,000 fire insurance companies in aid of the Fire Brigade. There is no doubt that in return for this taxation the inhabitants of London and its suburbs have received great benefits from the works of the Board, among which, as the most prominent, may be mentioned the system of main drainage, the embankment of the river, the formation of new thoroughfares, the establishment of parks, and the preservation of open spaces; beyond these, there are many minor improvements which the Board have from time to time aided the local authorities in carrying out by granting pecuniary contributions. But, notwithstanding that much has been done during the past few years for improving the condition of the metropolis, it is clear that its growing requirements will be very far from met unless additional facilities for traffic are provided, commons and open spaces secured, and other works executed which will necessarily involve

a large expenditure. The Board express a hope that the attention of the Legislature will shortly be directed to the important question of readjusting the taxation between the owners and occupiers of property in the metropolis, and that ultimately the requisite revenue will be placed at the disposal of the Board, without the necessity of imposing additional burdens on those who are already so heavily taxed—a "consummation devoutly to be desired" by that victim of circumstances, the British taxpayer.

OTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

HYDROGEN A METAL-GREEN PIGMENTS BATTERY-THE AMALGAMATION OF IRON.

HEMISTS have long argued, from certain analogies and behaviour, that the element hydrogen must be a metal, just as we infer, from the manners of a man, whatever his dress, that he is a gentleman or the reverse. By itself we only know hydrogen as an invisible gas. It was one of those which defied all the efforts of Faraday to press and freeze it into the solid or liquid form. But what Faraday was unable to do to hydrogen the gas readily does for itself-that is, takes the solid form. Mr. Graham has shown that hydrogen readily enters into, and, as he supposes, combines with the metal palladium, forming a true alloy of the two metals. He has determined the proportion of the two, and the density of the alloy, and thus is able to determine that the density of hydrogen=2 He has also measured the increase of bulk acquired by the palladium in its union with hydrogen, estimated the electric conductivity of the alloy, and found that it follows the law observed in all true alloys, and thus Mr. Graham asserts the real metallic nature of the invisible gas hydrogen. We shall refer to this matter again shortly, when further facts are before us.

The continued agitation some time ago about the danger of arsenical greens set chemists actively to work to produce pigments of the same colour free from poisonous qualities. We have already recorded the discovery of several processes for making harmless mineral greens, and to-day we find another, about which, however, not having had the opportunity of making an experiment, we can express no opinion. The inventor, M. Moulin, makes, first of all, a solution of zinc in hydrochloric acid, and a solution of oxide of cobalt in the same acid. The proportions are varied according to the shade of colour required; but taking always 100 parts of zinc there may be from 1 to 15 of oxide of cobalt. These two solutions are poured together and mixed while hot. Then a solution of carbonate of soda is added by which a precipitate of the mixed hydrated carbonates of zinc and cobalt is produced. The precipitate is washed with a large quantity of water to remove chloride of sodium, and then it is dried on chalk or plaster of Paris plates, and subsequently heated to 100deg. Wedgewhereupon it becomes of a yellow colour which changes to green as the mass cools. inventor states that if some sulphate of alumina be substituted for some of the zinc, the colour will have a bluish shade according to the proportion of alumina employed, about which there can be no doubt, as the compound formed will more or less resemble cobalt ultramarine. The great difficulty in the production of these colours will be the management of the heat. The inventor speaks of 100deg. Wedgewood. This temperature may mean anything between 1,000deg, and 1,500deg. Centigrade, or from a dull to an intense red heat.

A galvanic battery, which will be found very

enient under some circumstances, is described by M. J. Ney. A plate of amalgamated zinc is immersed in solution of chloride of ammonium, or,

some resemblance to Jacobi's chamber battery and like that is available where acid batteries are objectionable. The action consists in the decomposition of the sal-ammoniac, the chlorine of which goes to the zinc, while the ammonia passes to the carbonate of copper. When exhausted, the action carbonate of copper. is revived by the addition of sal-ammoniac.

Writing of batteries, reminds us that amalgamated iron plates have been recommended for use in place of amalgamated zino, the iron being much cheaper, and electrically of very nearly the same value as the zinc. But to amalgamate the iron has been a difficulty. Several methods have been suggested, more or less troublesome and expensive; but the following is comparatively simple, and is said to answer extremely well. The iron, carefully cleaned, is first done over with a solution of chloride of copper in hydrochloric acid, and thus a thin coating of metallic copper is obtained on the Upon this a solution of bichloride of mercury in hydrochloric acid is applied, and the whole surface becomes amalgamated. Whether whole surface becomes amalgamated. Whether the mercury really combines with anything more than the superficial coating of copper is more than we can say at present. But we are told that the coating completely protects the iron from rust. Various applications of this discovery suggest themselves—one mentioned by the author is, as we have said, the use of amalgamated iron plates in batteries.

#### ST. THOMAS'S HOSPITAL.

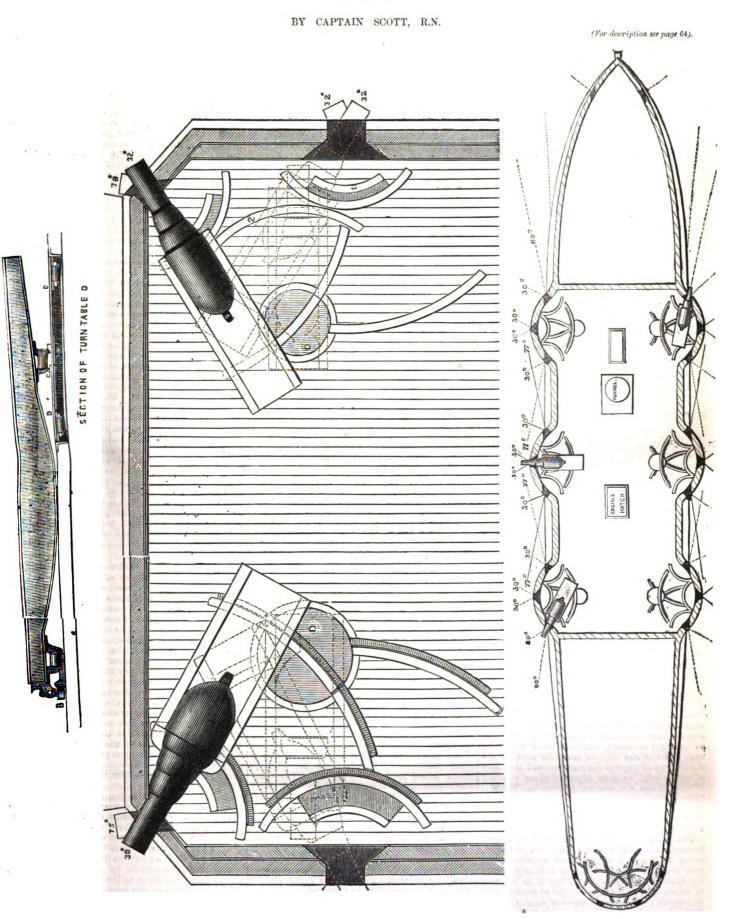
WE are glad to report that the construction of the new St. Thomas's Hospital is progressing very satisfactority. The works are let under two contracts. No. 1, the basement story, was taken by Mr. William Webster, the contractor for the Embankment, who has now brought his work to a finish, with the exception of a small portion of the nnish, with the exception of a small potential of any concrete arching under block No. 9, and the foundations of the boundary wall towards Palace New-road, which latter the architect does not wish executed at present. Contract No. 2, the contractor for which is Mr. John Perry, is progressing rapidly, there being not less than 700 men, artificers, and labourers employed daily on the works. The external masonry and internal walls of block No. 1 are carried up to an average height of 6ft. above the level of the one pair story. Of blocks 2 and 3 the walls of the eastern portion average 11ft. above the one pair story, and the walls of the pavilions 8ft. 3in. above. In block No. 4, the walls of the eastern portion are 11ft. above the one pair story, and the walls of the pavilion 8ft. 3in. above the same level. In block No. 4, the walls of the eastern portion are 11ft. above the one pair story, and the pavilion walls are 4ft. above one pair floor. The walls are 11ft. above the one pair story, and a portion of the above the one pair story, and a portion of the internal masonry of the chapel is carried up to the same height. The brickwork and masonry of block No. 6 is about 11ft. above the one pair story, and the pavilion walls are at an average of 4ft. above the one pair level. The walls of block No. 7, at the eastern side, are 10ft. above the one pair level, and the pavilion walls are built up to level of 6ft. above floor. The walls of the eastern portion of block 8, average 2ft. below the one pair level, and the pavilion walls, as in the preceding case, are carried up to level of one pair floor. Block No. 9 was not commenced until the end of September, and the walls are now 6tt. above the ground floor level. The entire of the wrought-iron girders for the first floor are fixed throughout, except to block 9, and these are on the ground ready for fitting, as well as the greater portion of the ironwork for the second floor.

THE MANUFACTURE OF WATCHES AND CLOCKS.

—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons by M. J. Ney. A plate of amalgamated zinc is immorsed in solution of chloride of ammonium, or, if the battery is to be carried about, may be set in sand wetted with a solution of the chloride. The copper plate is set in a porous vessel, filled up with carbonate of copper—the common mineral carbonate will answer the purpose, it is said. This combination, which is certainly cheap, gives, we are told, a lasting and strong current. It bears it to the notice of the intending purchaser.—| ADVY. |



# THE TURNTABLE SYSTEM OF WORKING BROADSIDE GUNS.



#### SOCIETY OF ENGINEERS.

T the first ordinary meeting of this Society for 1869, held on Monday evening last, Mr. Charles A 1869, held on Monday evening last, Mr. Charles
Julian Light, vice-president, in the chair, the
names of the council and officers for 1869 were
announced, viz., Messrs. F. W. Bryant, president;
W. Adams, C. J. Light, W. Naylor, vice-presidents;
J. H. Adams, B. Fothergill, R. Harris, J. Hendry,
E. J. Leonard, W. Macgeorge, G. W. Stevenson,
G. Waller, A. Williams, honorary secretary; Porry
F. Nursoy, auditor; and George W. Harris, secretary. The Society's accounts for 1869 were read,
and the following names of candidates for election and the following names of candidates for election were announced:—Messrs. Alfred Rubery and Charles C. Gibbons, as associates. Premiums for 1868 were presented to Dr. Edward Cullen for his papers on the surveys of proposed lines between the Atlantic and Pacific Oceans, the Panama Railroad, and the Darien Ship Canal; to Mr. Sydney A. Reade, for his paper on the sewerage works at Redhill; and to Mr. Arthur Rigg for his paper on the screw propeller. Mr. F. W. Bryant, president for 1869, was then introduced to the meeting, and delivered his inaugural address. At the close of the meeting, the following candidates for election as members were balloted for and duly elected:— Messrs. Thomas Carpenter, Ballarat, Colony of Victoria, Australia; and Robert John Mostyn, 18, Great George-street, Westminster.

#### THE PRESIDENT'S INAUGURAL ADDRESS.

In taking my place for the first time as president of this Society, I thank you for the honour you have conferred on me in electing me your president, an honour which I greatly esteem, and hope, with the assistance of the council, and the cooperation of the members generally, that I shall be enabled to carry out my duty to the satisfaction of all, and the advancement of the Society It is now more than ten years since I joined this Society, and I have much to thank it for in enabling me to glean a great amount of information in the various branches of the engineering profession. which I could not have obtained by my own practice alone. Therefore, I consider a society like this is of great value to a young engineer, and in many cases to those who are seniors in the profession. If a member attends regularly at our meetings, as he ought if he possibly can, I do not believe there is any paper read, or lecture given, from which he may not obtain some advantage. either from the paper itself, or by its causing him to think on the subject on which the paper is written. Then there are our visits of inspection to the important works in and around London, which, I trust, may be extended to more distant localities Those visits, excellent in as occasion affords. purpose and effect, are most valuable to all the members who attend on those occasions; for it is not only from one's own observations, but from the remarks of, and discussions with, those present at the time on the works actually in progress, that he who seeks to learn has every oppor-tunity of so doing. One of our older institutions, which holds periodical meetings at the larger manufacturing towns, is an instance of the advantage of these visits, as there is no doubt that the large increase of its members is mainly owing to this arrangement. I have much pleasure in remarking the kindness and courtesy with which this Society has always been received at the various works it has visited from time to time. I am happy to say I can congratulate you on the general advancement of the Society, both in numbers and position. When I first joined the Society we numbered but 127, and now that number of its When I first joined the Society members and associates is quadrupled. We have, as honorary members, many of those who take rank amongst the highest scientific men in the world; and as regards the members and associates of our Society, we have representatives of every branch of the engineering profession. There is scarcely any part of the world, where engineering works are being carried out, that there are not some of them to be found, working either as principals or assistants.

True it is, that since the last financial panic there has been considerable depression in our profession, owing to the want of confidence engendered by over speculation; but that can certainly not be the fault of engineers. Doubtless it is the duty of an engineer to carry out works as economically as possible; but there is another duty which he should be most careful of, and that is note to underestimate the value of any work, as that will in-evitably lead to confusion. Difficulties occur both at home and abroad, which one could

sometimes it seems as if he were expected to see beyond "mortal ken." I hope and believe that this depression will be gradually removed, and that we shall see engineering improvements increasing here and abroad, to the advancement of our profession and the benefit of mankind. I say to the benefit of mankind; for is it not to the drainage engineer that we owe the health of towns and agricultural improvements? to the railway engineer quick transit, the removal of goods, and the opening up and civilization of whole districts? to dock and harbour engineers the safety of the navies of the world? and so to all the branches of our profession, which tend directly or indirectly to the good of mankind in general.

And although there has been this depression, and men say, "there is nothing more to be done in England," surely this must be wrong. Are all our towns properly drained? all our rivers bridged over? all the docks, harbours, piers, and lighthouses, defence of shores (much wanted in many places), all water supplies and irrigations completed? all connecting lines of railways made? Are even the existing main lines perfect? as recent accidents lead us to think that it will be necessary to have separate lines for passenger and goods traffic-in fact, some of the engineers are taking steps to secure the necessary ground. Is the utilization of sewage properly done? Surely, then, with the return of public confidence in properly matured schemes, we may hope that engineers of Great Britain may find that there is vet something to be done in their native country. In and around London of late years there have been many great and remarkable works executed, some not vet completed, and I can scarcely imagine a better school for engineers, if they have properly studied the different important engineering operations that have been carried out. Many of these works will mark the present era of engineering for generations to come. Take, for instance, that grand work the Thames Embankment; although not yet completed, the portion now opened shows the great improvement it will be to London. I hope to see it extended on both sides of the river, so that the improvement may be made complete in the metropolitan district. The main drainage works are in full progress, and in a comparatively short time we shall doubtless have Lon don perfectly drained, and, as a natural result of this, the health of the inhabitants improved. The river Thames has decidedly improved in purity during the last few years, as I have had good opportunity of knowing. Various kinds of fish, from the dace to the porpoise, certainly made their appearance during last summer in the neighbourhood of Blackfriars Bridge. Then we have the Metropolitan Outer and Inner Circle Railway although not quite completed, yet the work already done is sufficient to command the admiration of all observers, professional or non-professional. I consider it, as a work, a credit to to our profession. Such a varied practice cannot have occurred in any other railway I know of, and it is, I think, a good example, showing that, whatever difficulties arise in the construction of works. they can be successfully met by a good engineer. Then there is the East London Railway in course of construction, which will no doubt be of great service, when completed, for public traffic; also other small branches, which are of importance to the main lines they belong to, and all tending to complete the railway system.

We have also had new docks-I allude to the Millwall Docks-opened during the last year, and improvements and enlargements at the West India Docks, which will no doubt be appreciated by the mercantile communities of London, and I may say of the world. Good dock accommodation is great desideratum, though sadly neglected in places where it is greatly needed. There are many positions on the coasts of England where good docks would be of great value and convenience, and I hope to live to see many such posi-tions naturally formed for harbours and docks taken advantage of for their construction. The bridge over the Thames at Blackfriars has made good progress during the last year, and I expect to see it open for public traffic about the middle of this year. This will also be a great metropolitan improvement. The Holborn Valley Viaduct will be of great utility, and is also progressing rapidly towards completion. There is an improvement very much wanted in London, and that is a footway bridge crossing over our principal thoroughfares; and in places like Regent Circus, or the bottom of Fleet-street, a four-way bridge

might be erected at a small cost, and would very soon prove if it were of practical uso. Engineering work in Great Britain has generally been very slack during the last year, It has had many things to diminish its chance of prosperity. The Abyssinian war, the unsettled state of and revolution in Spain, and the doubtful position of politics with regard to war in Europe, all tended to the stagnation of work. prosperity of civil engineering peace is absolutely and I hope and think we may look fornecessarv ward to it with confidence.

The general election, without doubt, materially interfered with engineering establishments all over the kingdom. I think, however, I may congratulate you upon the fact, that the prospect of an increase of work is decidedly brightening in the iron districts, which is a good criterion for our profession generally, although report states that Belgium houses have an immense amount of work in hand. The "Iron Trade Review" of December 23, 1868, states that they "have now secured, or are in treaty for, contracts to the extent of something like 90,000 tons of rails"; and further on remarks :- "We may ask, what English firms durst venture to take contracts for such a period in advance in the present state of the market, in consequence of the constant insecurity from a movement on the part of the workmen for advanced wages; and experience has shown that this is almost sure to be their tactics whenever they know that employers have heavy con-tracts on hand." This, I am sorry to say, I believe This, I am sorry to say, I believe to be the case. Every man has a right to obtain as much as he can for his labour; but it is unfair, after a master has taken a contract, for workmen to demand a rise of wages before the completion of that contract, and it is much to be regretted that workmen should do so, as in many cases it prevents the ironmasters of England from taking work. It is a difficult question, but one of great importance, to institute a proper system of arbitration between men and masters; and whoever could arrange a good method of effecting this would be rendering his country a great service. The export trade of manufactured iron into France has decreased by some 5,000 tons in 1868 from that in the preceding year; still I perceive a great probability that the decrease will be altered to an increase during this year. I am glad to find, also, from public reports, that our exports of iron to America are decidedly on the increase; and from the friendly relations now existing between the two countries, and also from the low state of stocks of iron generally, we have every reason to expect that our exports will be much larger during the present year, and I most sincerely trust that not only mutual improvement of commerce, but of good feeling, will continue between Great Britain and America and all other parts of the world.

Certain I am, with regard to our nearest neighbours, that the sentiment of peace which the Emperor has lately expressed, confirms my ide the probable increase of trade generally. While on the subject of iron, I have great pleasure in remarking that we have to welcome a new society lately formed, under the title of the Iron and Steel Institute, and I learned that, in the short space of two months, 150 gentlemen directly connected with the iron and steel interest have signified their intention of joining the new institute. There can be no doubt that much good will result from the information they will be able to afford our profession. In Great Britain there have not been very many engineering works of great interest carried out during the last year. The principal amongst those completed is the bridge over the Mersey at Runcorn, and the viaduct over the Solway. Of those in progress there is a bridge over the Trent at Nottingham, which I believe will be a very excellent example of its sort when finished. I may also mention the Chatham Docks. These works are on an extensive scale, and will no doubt be of great value to the service they are required Then there is the new dock at Hull, the Sunderland Docks, and the Tyne improvements. One of the most important questions that en-gineers have before them is that of town drainage and irrigation-a subject that has been particularly brought before us by our late president, who certainly has given us the benefit of his considerable practice in that branch of civil engineering, and for which we have much to thank him. The boldest of the proposed engineering works connected with England is that of passing under or over the Channel, for which we have three schemes, i.e., by means of a bridge, a tunnel, or a steam ferry. The first of these I do not expect to see scarcely expect to have been foreseen; for, after would be very desirable. I see no reason why ferry. The first of these I do not expect to see all, an engineer is but a human being, though they should not be tried. A light iron structured out; the second I believe to be quite practicable, the cost appearing the great objection; the third seems to me the most practical proposition, and I have no doubt would be found of great service to the public. On the continent, during last year, there have been some remarkable works completed, and many in progress, and if peace continues, and Spain settles down to working instead of fighting, I think we may reasonably expect a considerable advance in engineering works in that country, where there is a considerable field for engineering of all kinds; in Turkey, also, railways more particularly, improvements are much wanted. Then there are the Wallachian lines to be completed, and I understand some large contracts have lately been taken in that part of the world by English contractors this year. In Russia there will be heavy railway works in progress; Italy and Sicily will possibly add something to the European railway system.

The most remarkable railway work opened for traffic during the last year, is that over Mont Cenis, and, in spite of differences of opinion as to details in working, it must be considered a great engineer ing achievement. Its rival, the Mont Cenis tunnel, is gradually progressing towards completion, and when it is done, will solve the problem of under versus over mountain travelling. Bridge engineering has also been represented by some very fine, and, in some cases, novel structures. Perhaps the most novel, and certainly one of the finest, is that over the Moldau, at Prague, on the rigid suspension principle, which seems to be very successful; and I am very pleased to remark that Mr. Ordish, the engineer of this bridge, an old member of this Society, and one of its past presidents, has been presented by the Emperor of Austria with the gold medal of Arts and Sciences of that country on the opening of the bridge, and one of our prize-men (Mr. Wessely) with the gold order of merit, for the part he has taken in the con-struction of the bridge. One of the finest rail-way bridges in Europe has been constructed over the Rhine, at Kuilemburg, in Holland, which does great credit to its engineer and those who have carried it out. Its construction is, doubtless, fami-liar to you all, through the medium of the London scientific papers. It is remarkable for its large span of 492ft. in the clear. Among very numerous great European works in progress, may be mentioned the docks at Havre, which will, I understand be very fine when completed; and the drainage works and the canals in Holland.

Let us now travel eastward, and, crossing into Africa, we come to one of the grandest works of modern times—the great ship canal across the Isthmus of Suez. Already a small schooner, "La Levrette," has made a passage by the canal across the Isthmus; and I learn, on the best authority, that in about six months it is probable vessels of the largest size will be able to pass through the Isthmus from sea to sea. If this is realized, what a great engineering triumph it will be; perhaps even altering the fortunes of nations. Certainly, it will make a great difference in our Indian trade, but time will soon show; and it is scarcely worth theorising when we shall so shortly know what the result will be.

In India, again, what a great revolution engineering is effecting in that vast empire, and what an immense amount of work there is yet to be done in every branch of our profession; and, from what I can learn, there is now a great want of engineers in India, preventing works already proposed from being carried out. There are many difficult problems in engineering to be solved: one, I may mention, that appears to be more than ordinarily so, and which has yet to be overcome—I allude to the bridge over the Hooghly, which has taken up the attention of many engineers for some time past, without any practical result. Still there are works progressing of very great extent, in which there are many difficulties, taxing the skill of the engineers in every way. Take, for instance, the Great Indian Peninsular, the Bombay and Baroda, the Great Southern of India, and other railways; the dock and harbour works at Bombay and other parts of India, the progress of which we get reported to us from time to time.

Telegraph engineering is extending most rapidly, and ere the end of this year we may expect that the French Atlantic cable will be laid, forming another link between the old world and the new. And I believe that the time is not far distant when we shall have communication by telegraph with China and Australia. One seems to suggest the other, as it would doubtless be via China that a telegraphic line to Australia would be laid. Then there are the North Sea cables, which will be connected with an overland cable and carried on to India

through Prussia, Russia, and Persia. More particularly concerning us here, is that our Government will, in all probability, this year arrange that the Postmaster-General will have complete command of the telegraphs in this kingdom, which will be of great importance and value to the public in general, and I hope to see before long telegraphy as cheap as postage.

Engineering goes hand in hand with civilization, and, as we have seen, the rapid alteration railways have made in changing the aspect of towns and villages in England, and even the manners and customs of their inhabitants in many ways, so can we imagine the great alterations that will take place in India, when railways become common, and good roads and bridges abound in every locality. alterations will probably extend to China, and that curious race become more civilized, be better known to us, and their barbarous customs discontinued. In Australia, also, engineering is There are even now many large progressing. works necessary for the benefit of its inhabitants generally, and, as the population increases, will become absolute necessities. In America, since the late sad warfare has ended, engineering has made a brisk recommencement in many places, and I learn, on good authority, that the great question of the junction of the Atlantic and Pacific Oceans by a ship canal across the Isthmus of Darien is again mooted, and that the American Government have actually sent a gentleman of high position to make negotiations and inquiries respecting its being carried out. Our transactions for last year will contain, in papers read by Dr. Cullen, an excellent account of all that has been done with regard to this grand project.

In railway and bridge works, American engineers have proved themselves remarkable for their boldness of design and rapidity of execution. Take, for instance, the suspension bridge thrown across the Niagara River last year, which has the tremendous span of apwards of 1,260ft., or nearly double the width of the centre span of the late Hungerford Suspension Bridge. And we read of still greater spans as being proposed and probably carried out. Then there is the proposed bridge carried out. over the Mississippi at St. Louis, which will be a novelty in bridge building, as it will consist of three arches constructed in steel, the centre span of which will be 515ft., or some 35ft. wider than twice the span of the centre arch of Southwark Bridge. Some of the railways constructed with great rapidity (although it must be borne in mind that the style of work is totally different to that prevailing in England), and great ingenuity has been shown by the manner in which American engineers have passed their railways over most difficult countries. Both in North and South America there is a vast field for engineering enterprise in all its branches. Also in Canada it is known there are many important works required that sooner or later must be carried out.

I have not perceived anything particularly novel that has been introduced into civil engineering of late, although I must not forget to mention fact that, instead of building docks abroad, they built at home, and sent abroad to be ed in position. I instance the Bermuda float placed in position. I instance the Bermuda float dock, built in the Thames, now lying in the Medway, which leaves for its destination early this year; also a floating dock for Bombay. In foundations—which are the most important studies of an engineer—cylinders and screw-piles seem to be the favourite methods at present for bridge foundations, piers, and other works in water. In the London district, it seems the general opinion that, for large buildings, it is necessary to go down to the London clay for a foundation. I cannot perceive the absolute foundation. I cannot perceive the absolute necessity for this, and I think in many cases it might be avoided, at a great saving in cost. In mechanical engineering, improvements in detail appear to be constantly made. The great question as to the manufacture of steel seems to be still in dispute. We have not yet seen it used for any structure of importance in England at present, although I think it is probable we may do so before long. In cases where lightness is required rith strength it might be used very advantageously.

Hydraulic engineering has advanced to great perfection. Photography, which has been much improved during the last year, has proved invaluable to the engineer in illustrating the progress of works. Electricity—the most wonderful of all things applied for the use of mankind—has not yet been successfully used as a motive power; a single idea might revolutionize the whole of our present practice. Civil engineering is the application of natural philosophy, and it is by studying the great

laws of nature that we may hope, no matter by how small advances, to improve our profession.

In conclusion, let me particularly urge upon you, the members and associates of this Society, the necessity of earnestly working for its advancement. By becoming members, you show that it has your good wishes; but it wants more than good wishes—it wants your working assistance to further its objects. By attending its meetings you show a disposition to support those who are working for it; and by contributing papers, a willingness to give the knowledge you possess, not only to the Scoiety, but to the profession generally.

#### TELEGRAPH WIRES IN ARCHITECTURE

THE courts of law stubbornly set themselves against innovations, but in the end they give way to the result of established practice. It was only in the reign of Charles the Second that they came to a knowledge of bills of exchange, and they afterwards advanced to bankers' cheques and crossed cheques. They have latterly found out the Stock Exchange has been in existence for some time. Some solicitors are still wary of envelopes, and others doubt as to press copies of letters, preferring a law stationer's copy; but many believe in the penny post and in telegraphs. So, too, in the course of time, will some architects come to an after knowledge of many things which have been going on for some time, including a provision even for letter boxes. In this day, inventions disturb us in a pantomimic way. The telegraph was at first tolerably unobtrusive. It confined itself to railways, but having crept into towns, it jumps across the house-tops in various directions, without any regard to symmetry, and its wires are no more ornamental than clothes' lines, nor its posts than washerwomen's poles. The wires will go on, and their existence must be acknowledged. Our predecessors acknowledged weather cocks, and made N. E. W. S. ornamental. Is it not time for the architect to determine how far he can prevent the spider's web of telegraph wires from injuring his work? It is not one light almost invisible wire, but four or five strained taut, or a good wire cable hanging in a curve from steeple with light wires looped on to it. The supports are unredeemed abominations.

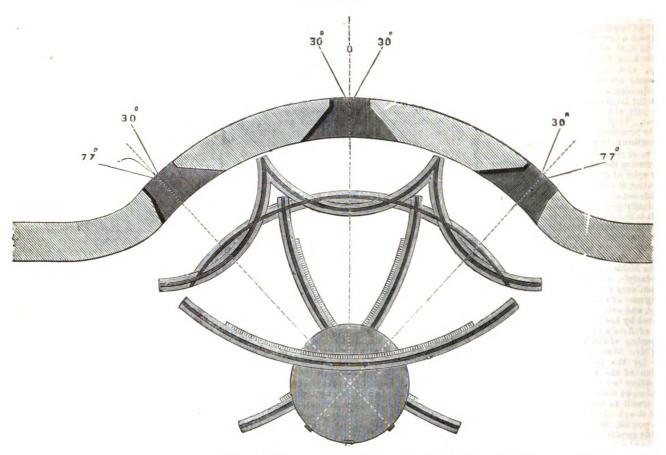
prevent the spider's web of telegraph wires from injuring his work? It is not one light almost invisible wire, but four or five strained taut, or a good wire cable hanging in a curve from steeple with light wires looped on to it. The supports are unredeemed abominations.

In the case of a railway bridge, a design is made in which every line is carefully studied, and then are put up the thick clusters of terminal and through wires, and pillars of signal stations, and the whole design is disfigured. If the bridge rests on iron piles, nothing would be easier than to have a telegraph pole in the line of each pier, but then the architect has never provided for it, and a workman is allowed to set up his posts at his own intervals—perhaps so many to the mile—and the wires he places at the height he thinks right, with any kind of insulators, utterly destroying the lines of a fine bridge. It is rare that the wires are kept below the parapets. Of course it is wrong for a casual workman to be allowed to do so, and directors and engineers never think of such things; but then they should be thought of in the design of the bridge, and Hungerford Bridge are all laid out as great monumental railway works, and anyone must know that on a railway there must be signal posts and telegraph wires. The lamp-posts are in some instances carefully provided for, and there are well-grouped clusters of lamps, but the other accessories mar the plan. It was possible, and may be still, so to place the signal posts, telegraph posts, and lamps, that while there is a group of signal posts at each end of the bridge, the telegraph posts if carried up, shall combine with the candelabra and correspond with the piers of the bridge, if placed on cast-iron piles or masonry. The Hungerford Bridge is one of the best arranged in this respect. The telegraph wires can very conveniently be kept below the line and worked into the details of the bridge. Where signal posts and telegraph columns with insulators are carried above, as they can be formed of metal, a

can very conveniently be kept below the line and worked into the details of the bridge. Where signal posts and telegraph columns with insulators are carried above, as they can be formed of metal, and as the insulators are of porcelain, it is quite possible to introduce gilding and colour, so as to compose with the decoration of the bridge.

There are also many cases of the erection of telegraph posts in towns which could be distinctly treated; in fact, it is only by such care that an architect can guard his work from after defacement by bell-hangers, gasfilters, decorators, upholsterers, and the whole horde of disfigurers. The Thames Embankment is very likely to have telegraph wires carried along it or near it, notwithstanding the subways, and then fresh lines will be introduced to compare with those of its mouldings. The Embankment has dealt rather recklessly with Somerset House and other buildings in its course, and we may look out for the like reckless dealing with the Embankment itself. There is an utter disregard in London of common administrative care, so that the natural artistic effect of our monuments is allowed to be tampered with indiscriminately, and the stock of our artistic wealth destroyed.—"Building News."

#### TURNTABLE SYSTEM OF WORKING BROADSIDE GUNS.



#### WORKING HEAVY GUNS.

WORKING HEAVY GUNS.

THE engravings on page 61 are illustrative of the system of working heavy guns on the broadside as proposed by Captain Scott, R.N., and adopted in the "Hercules." The problem to be solved is simply to obtain the greatest range of fire with the fewest guns, and the solution has been thus worked out. Our engraving shows such a casemate as is carried by the "Hercules." Ports worked in the side of the casemate permit a lateral fire, and ports in the thwartship bulkheads permit the guns to be fired nearly ahead or astern. This the guns to be fired nearly ahead or astern. This has already been done in the "Pallas" and "Research," and is found to be objectionable in several respects. Guns cannot be worked in both the corner ports, as we may term them, at the same time, as there is not room. It is therefore necessary to provide means by which a single gun can be transferred at will from one port to the other. Such an object is ordinarily effected in the following way:—The gun carriage runs on a slide, which slide is a parallelogram made of timber or iron, supported in its turn on small rollers, which run racers or arcs of metal secured to the deck. From the forward end of the slide proceeds a V-shaped piece of iron, the ends of the V being jointed The apex of the V is provided with an eye which fits down on a tapered pin in the centre of the port, and round this pin as a centre the slide, and with it the gun, can be made to radiate each way through an arc of about 30deg. The gun is principally secured by this pin and the V flap. Now, in order to transfer the gun from one port to the other, it is obvious that the V must be lifted off the pin, and the gun brought round by tackles until the eye in the V coincides with the pin in the second port. Even in calm weather this would not be very easily effected, as the eye just fits the pin, and it is no easy matter to move a dead weight of eight or ten, much more of twenty, tons to a quarter of an inch, and in rough weather it could hardly be an inch, and in rough weather it could hardly be effected at all, as the gun would be left comparatively uncontrolled. In order to provide for this, a second V is fitted to the rear of the slide when it is required to shift the gun, and the eye in this being dropped on to a pin in the deck inboard, the leading V is cast free, and the gun slide is then made to turn on its heel and radiate round to the other port, when the leading V is dropped on

to its pin and the rear V removed. The gun is then worked in its new position as it was in the old. In practice this system of movement is found to work unsatisfactorily in the case of all but small guns. The operation is tedious, uncertain, and dangerous at the best of times at sea, and in heavy weather it is highly imprudent to attempt

This difficulty is overcome in the following manner by Captain Scott. In the first place, the pins and V-pieces are entirely suppressed; just inside the ports are fitted gun-metal racers 1 1, shown in section in the side view of the gun slide. To the leading end of the slide a small roller is fitted, which bears against the raised flange of the racers 1 1, and being caught under the upper horizontal flange, prevents the slide from jumping up er running in, in which latter purpose it is aided by the flanges on the trunnions of the slide, as shown in the sectional elevation. By taking out a key, B can be turned up on the horizontal pin, and the slide so far left free. The gun will radiate round either port as a centre in the ordinary way, travelling on the racers 1 1, G G. It remains to be seen how it is to be transferred from one port and set of racers to the other port and set of racers.

In-board, and at a point equidistant from both ports, is fitted a small turntable let into the thickness of the deck, so as to be flush with its upper surface. The construction of this table will be understood from the sectional elevation. It carries a portion of one racer, and by causing this table to make a portion of a revolution, either one are or the other can be rendered perfect, or both broken. Supposing the gun is to be moved from the side to the front port, it is first run in until nearly over the turntable, in order that its muzzle may clear the ship's side; its entire weight is then borne by the turntable; B is then cast loose, and the turntable is caused to partially rotate, carry-ing round the gun until the section of racer carried by the table completes the racer belonging to the forward port; B is put in gear, the forward trunnions brought to bear on their racer, and the thing is done. If thought necessary, a subsidiary racer 2 may be introduced to give more security to the gun when being swung from port to port. Nothing can be more simple than the entire arrangement, and its superiority, not only over the system of transfer which we

first described, but over all other methods of working heavy guns on the broadside yet proposed, is apparent at a glance. The operation of transfer is exactly identical with that performed daily at every railway terminus in the kingdom when a locomotive is shunted by means of a turntable; and there is no reason to doubt its complete success. In our engraving, we have shown a 600-pounder gun on one side, a 9in. 12-ton gun on the other. The system is equally applicable to both, or to the 18-ton 10in. guns.

Before concluding, we may direct attention to an important development of this system of transfer. With a given weight of armour it is well known that a greater number of guns can be protected on the broadside than in turrets. But whereas the turret guns can range nearly round the horizon, when masts are dispensed with, guns in broadside when masts are dispensed with, guns in broadside ports can only be trained through an arc of about 60deg., and they cannot be worked satisfactorily at the maximum degree of training, as the crew are in each other's way. It is proposed, however, to construct casemate ships as shown in the illustration at page 61. The casemate might be so arrested to its construct which is the chick but the construct of the const ranged that it would fall within the ship's bul-warks turret fashion, even at the place of maximum projection. The number of guns to be carried would vary with the size of the ship. The details of the mode of working the guns will be understood from what we have already said. The racers, racks, and turntable would be flush with the deck, and the extreme range of each gun would be about 154deg. instead of 60deg. By carrying the armour of the casemate inboard, less strain would be thrown on the hull, and the ship would be rendered steadier in a sea way. A light living deck forward and aft would provide ample accommodation for the crew, and might be knocked to pieces in action without impairing the efficiency the ship at the time, or endangering her safety; and there can be no room to doubt that an exceedingly safe and serviceable cruiser could be thus produced.

In 1867, the number of emigrants who left the Mersey was 115,681. In the year just concluded, the number was 129,337, or an increase of 13,656 on the year. Of the total number, 102,323 were for the United States, 15,409 for Canada, 1,601 for Victoria, and \$40 for South America.

SAVING LIFE FROM SHIPWRECK IN 1868

THE past year will long be remembered as one of the stormiest on record. It is, however, satisfactory to find that the year will also be well remembered for the great exertions which have been put forth to save shipwrecked persons. appears that during the past twelve months the boats of the Royal National Lifeboat Institution have been instrumental in saving, during boisterous weather, the crews of an unprecedented number of distressed vessels on the coasts of the British Isles. From a long list now before us, we find a total of 558 lives rescued by the lifeboats of the Institution, in addition to 23 vessels saved from destruction. During the same period, the Lifeboat Institution granted rewards for saving 259 lives by fishing and other boats, making a grand total of 817 lives saved mainly through its instrumentality. In the same period, the crews of the lifeboats of the Society, at a very large expense, have either assembled or put off in reply to signals of distress 142 times to ships not eventually requiring their serrices. It often happened that on these occasions the lifeboat crews had incurred much risk and exposure throughout stormy days and nights. number of lives saved either by the lifeboats of the Institution, or by special exertions, for which it has granted rewards since its formation, is 17,795, for which services 90 gold medals, 798 silver medals, and £28,906 in cash, have been given as rewards.
When we remember that nearly every life saved by lifeboats has been rescued under perilous circumstances, it will at once be seen what great benefit has been conferred by the Lifeboat Institution, not only on the poor men themselves and on their country, but also on their wives and children, who would otherwise be widows and orphans. Since the beginning of the year, the Institution has spent £18,818 on its 194 lifeboat stations on the coasts of England, Scotland, and Ireland: and since its first establishment in 1824 it has expended £212,820 on its lifeboat stations. strongly urge on all who recognize the sacredness of human life, the duty, and even the privilege to help forward the lifeboat work, a work which has hitherto been manifestly blessed by Providence, and which has brought relief to many thousands of men, who, instead of being this very day valuable members of the community, would have been long ago engulphed in the raging waves of the tempest, leaving, in many cases, widows and orphans to suffer not only the misery of bereavement, but the pangs of destitution. We will only add, that contributions are received for the Lifeboat Institution by all the London and country bankers, and by its secretary, Richard Lewis, Esq., 14, Johnstreet, Adelphi, London.

#### COPPER PRODUCE.

THE production of copper in the United Kingdom and the value of the product continue to decrease. In 1857, 250,871 tons of the ore were raised, and were found to be of the value of £1.560,922; in 1867 only 158,544 tons were raised, and their value was but £699,693. The metallic copper produced amounted in 1857 to 17,375 tons, of the value of £2,154,500; in 1867 it was only 10,233 tons, and of the value of only £831,761. This decline has been chiefly in the last seven years. The quantity of the ore raised in 1860 was as much as 236,696 tons and its value was more than double the value of the 158,544 tons raised in 1867; and the metal produced in 1860 was as much as 15,968 tons, and its value more than double the value of the 10,233 tons of 1867. The average price obtained for Cornish copper was £6 8s. 6d. in 1857, £5 19s. in 1860, from which last date it gradually declined until it reached £4 7s. in 1867. Of last year's 158,544 tons of copper ore, 88,660 tons, of the value of £413,876, were raised in Cornwall; 31,311 tons, of the value of £144,773, in Devonshire, more than 20,000 tons from the Devon Great Consols Mine; 8,406 tons, of the value of £26,655, in Wales; 12,482 tons, of the value of £83,529, in Ireland, chiefly Cork and Waterford. Of the 10,233 tons of metallic copper obtained, 5,995 tons, of the value of £494,179, were from the mines of Cornwall: 2,055 tons, of the value of £169,114, from Devonshire; 452 tons, of the value of £34,460. from Wales; 1,189 tons, of the value of £93,874, from Ireland. The number of mines returned was 188 in 1857, 170 in 1860, and 164 in 1867.

THE total cotton receipts at all the U.S. Southern ports from September 1 to the close of 1868 were 1,067,549 bales, as compared with 947,092 bales during the same period of 1867.

#### PHOSPHATES IN AGRICULTURE

UCH attention has been given of late in France A to the treatment of coprolites and other bodies containing phosphates applicable as manures; and an agricultural writer, M. Adolphe Bobierre, has given, in the "Journal de l'Agriculture," of Paris, an agricultural without, given, in the "Journal de l'Agriculture," of Paris, an account of the methods in action, and experiments in connection with this important question. "Charges from tropical regions," says M. Bobierre, "Guanos from tropical regions," says M. Bobierre, bone ashes from the pampas of Central America, phosphorites and apatites from Spain and Portugal, coprolites and nodules from the carly limestone formation, the refuse of sugar-houses and refineries. gelatine and button manufactories—everything, in fact, which contains phosphoric acid in any quant is now the object of serious, and generally profitable, application. Guano is obtained from the giddy heights of the mountain peaks in sight of the coast of Bolivia, while in the Ardennes it is found worth while to remove sixty or more metres of argillaceous earth to obtain a ton of phosphated nodules, which, when washed and pulverized, rival bone-black." The writer recognizes the great activity of English chemists and agriculturists with respect to phosphates and the production of superphosphates, and the immense services which they have rendered; but adds, that the manufacture of superphosphates cannot be said to be perfect so long as the sulphuric

With respect to what has been done in France. M. Bobierre gives some interesting examples. The nodules of phosphate of lime have been largely employed in Brittany, in the cultivation of the Landes, in the place of bone-black, which has been used largely for thirty or forty years; this has created a very important employment; and we are told that wery important employnent; and we are told that many of the dealers in manure have entirely given up the sale of bone-black for that of pulverized fossil phosphates. Attempts have been made to separate the phosphates from the thirty per cent. or more of silicious matter with which they are associated, and also, on the other hand, to produce mixed manures, in which the activity of the phosphoric acid should be brought out in the most effective manner; these desiderata have been realized with considerable success. One process is to treat the rough phosphates with chlorohydric acid, and to recover the acid by evaporation. Another process mentioned is to convert the nodules into metallic phosphates by calcination in a blast furnace, in contact with iron ore, and then to transform the metallic phosphites into alkaline phosphates by the action of chloride of sodium at a high temperature. A third method is to attack the fossil phosphates by many of the dealers in manure have entirely given A third method is to attack the fossil phosphates by means of chloride of manganese with an excess of acid, obtained from the manufactories of chlorides for bleaching and other purposes; and, lastly, the fossils are sometimes simply calcined with gas tar or other similar substances.

The writer says that the results of the above methods and experiments have confirmed him in a reviously expressed opinion, that if the nodules be previously expressed opinion, that if the normies be reduced to a powder, and the powder exposed to the action of the air, and applied to soil requiring the application of phosphoric acid, the fossil phosphates are perfectly assimilated; and, further, that a mixture are perfectly assimilated; and, further, that a mixture of fossil phosphates with ordinary manure yields the most admirable results, even in the case of old cultivated lands. "Let farmers only adopt the habit of throwing fossil phosphates under the animals," says the writer; "nothing more is required." M. Bobierre seems to consider the treatment of nodules by means of acids as scarcely called for, but recommends this process strongly in the case of phosphorites, apatites, and certain phosphatic guanes found almost in a vitrified condition. With respect to France, the writer observes that phatic guanos found almost in a vitrified condition. With respect to France, the writer observes that within a short distance of the coasts of Spain and Portugal, where the tribasic phosphates, containing 70 to 90 per cent. of phosphate may be obtained at the rate of 2s. 6d. to 3s. 4d. per cwt., enormous quantities of hydrochloric acid are wasted, and worse than wasted, by being allowed to vitiate the air; the town of Marseilles, which converts large quantities of sea-salt into sulphate of soda, is destined to waste annually fifty millions of pounds of hydrochloric acid, which could, with very little trouble, be made

acid, which could, with very little trouble, be made to dissolve the natural phosphates.

In connection with the above may be mentioned a communication made by MM. Dusartand Pelouze, to the Academy of Sciences. One of these gentlemen, in a work entitled "Researches on the Assimilation of Phosphate of Lime," showed that, when acted upon by the gastric juice and very diluted lactic acid, phosphate of line underwent partial decomposition, yielding a mixture of lactate and lactic acid, phosphate of lime underwent partial decomposition, yielding a mixture of lactate and acid phosphate of lime; this led to experiments on the action of carbonic acid on phosphate of lime, with the view to throw some light on the obscure with the view to throw some light on the obscure subject of the assimilation of phosphate of lime by plants. In 1864, M. Dumas noticed that carbonic acid was a solvent for phosphate of lime, by the effect of seltzer water, in softening ivory and abstracting all the calcareous phosphate therefrom Other chemists have regarded this action as merely a solution of the salt by the carbonic acid, but MM. Dusart and Pelouze are of opinion that the action referred to is of a more complicated character,

and that the acid absorbed gives birth to new

products.

These gentlemen treated gelatinous phosphate of These gentlemen treated gelatinous phosphate of lime with water, saturated with carbonic acid, and found that after some time the acid had partly disappeared, and the phosphate itself had notably diminished; the transparent liquid obtained by filtration deposits by heat a crystalline precipitate, composed of phosphate and carbonate of lime. A series of nice experiments is then detailed to prove that bibasic phosphate of lime is produced, either by the action of carbonic acid on tribasic phosphate of lime, or by that of acid phosphate of lime on the carbonate. On this principle, say MM. Dusart and Pelouze, we have been able to produce it, by the following economic practical method, in such a state of purity that, compared with superphosphate, it contains double the active power in an equal volume. contains double the active power in an equal volume. The matter to be dealt with—natural phosphates, coprolites, bones or animal charcoal—are placed in wooden vats lined with lead, communicating with each other and covered with a mixture of water and acid; any acid will effect the transformation, but we prefer hydrochloric acid or the weak nitric acid, which is wasted in so many works. When the acid has macerated in one vat, we remove it into a second, and if necessary a third, and the clear liquor is finally treated with pulverized carbonate of line; effervescence is moduled analysis and analysis analysis and analysis analysis and analysis analysis and analysis analysis and analysis and analysis analysis and analysis and analysis analysis and analysis analysis and analysis analysis and analysis analysis analysis analysis and analysis anal finally treated with pulverized carbonate of line; effervescence is produced, carbonic acid is thrown off, and a precipitate of white crystalline bibasic phosphate of line is thrown down. When sufficient carbonate is used, the liquor is deprived of all the phosphate that it contains, and the precipitate is easily dried and washed.

There facts early the chamiets in question to

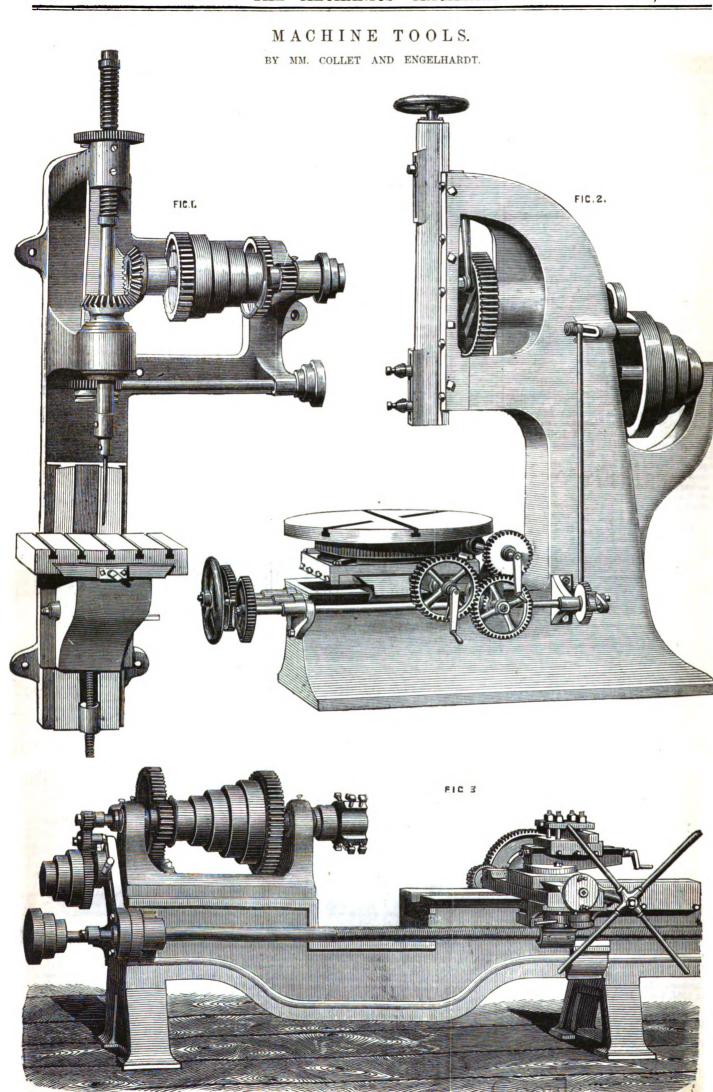
easily dried and washed.

These facts enable the chemists in question to form the following hypothesis concerning the manner in which nature enables plants to take up phosphates. It is evidently in the soluble form that the plant uses them for its nutrition; the common phosphate of lime, completely insoluble in water, should therefore be rendered soluble. Carbonic acid dissolved in water performs this first transformation in the same way that the stomach of an animal renders it soluble by converting it into acid phosphate and lactate of lime. The enormous quantity of superphosphate of lime employed in England, a practice now adopted in France, is quoted in support of the above theory. The superphosphate, which, according to these gentlemen, is only an impure acid phosphate of lime, when introduced into the soil, attacks the carbonate of lime, under the influence of lumidity, and is thus transformed into a bibasic phosphate. As it is impossible to imagine that any substance can be entirely absorbed by plants during the plant uses them for its nutrition: the common phosphate. As it is impossible to imagine that any substance can be entirely absorbed by plants during the first few days of its being spread upon the ground, if the superphosphates do not undergo this transformation, which diminishes their too great solubility, they would certainly be carried down to the sub-soil by the first heavy rain, and part of their value thus lost. The facility with which bibasic phosphate of lime can be produced in a state of great purity renders it a promising substitute for common phosphate, and even for superphosphate, which is always mixed with a large proportion of which is always mixed with a large proportion of other matters, which have no value as manure, and of which the cost of carriage is, therefore, at any rate, a loss to the farmer.—"Society of Arts Journal."

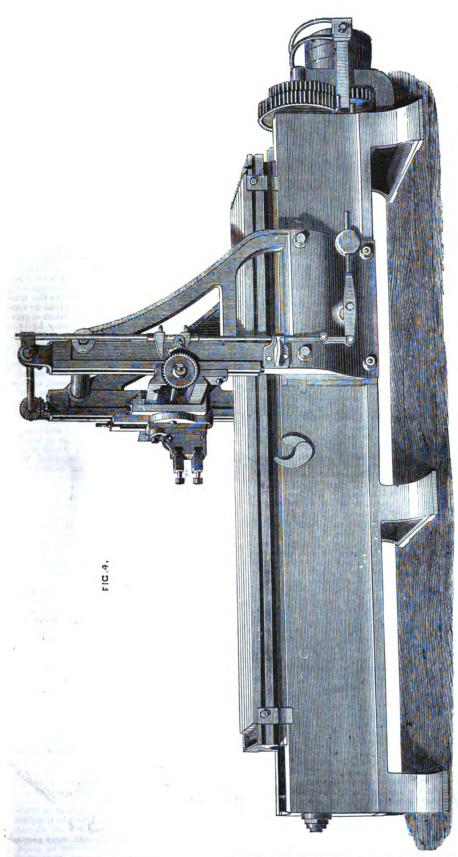
#### PREPARING CABINET SPECIMENS.

T a recent meeting of the Manchester Literary and Philosophical Society, Dr. Alcock showed a preparation preserved by corrosive sublimate in a manner which he recommended for fine dis-The preparation had been kept in an open cup for twelve months, simply water being added occasionally to supply what was lost by evaporation. The advantages of the plan were, very perfect preservation, no necessity for closing u) so that the specimen could not be got at, no fear of losing a valuable dissection from accidental evaporation, as where spirit is used, and cheapness. The method adopted was to propure a saturated solution of corrosive sublimate in alcohol, and when a dissection in water is in progress a small quantity, as half a teaspoonful, of the solution is to be added from day to day if the slightest appearance of putrefaction is observed, but no more of it is used than is absolutely necessary, and by the time the dissection is completed, the specimen has become imperishable, from the union of the corrosive sublimate with the tissues, and it may then be kept in pure water, either open or mounted in the

A CELEBRATED cliff in Denmark, the "Queen's A CELEBRATED cliff in Denmark, the "Queen's Seat," has just fallen bodily into the Baltic from a shock of earthquake. The rock, about 400ft, high, was an object of great interest to tourists from the magnificent view to be had from it. On a clear day, Rogen and the coast of Pomerania could be plainly seen. Everything has disappeared except some masses of chalk which form a sort of island near the shore. No life has been lost, but the inhahitants of the coast of the coa the neighbouring villages were terrified at the noise produced, and which lasted several seconds.



#### MACHINE TOOLS.



MACHINE TOOLS.

IN the annexed engravings we illustrate a set of machine tools, by MM. Collet and Engelhardt, mechanical engineers, of Offenbach. These tools are well worthy of notice as good plain pieces of work, well designed and carefully executed. They have the stamp of English models on them, but it is scarcely possible to find an original pattern of a machine tool out of England, though there are now perhaps as many makers of such articles abroad as at home. The foreign workman has not

yet the self-reliance which long education and the successive improvement of two generations hav given to our best hands, but they are rapidly improving, and are just as well able to execute work up to a moderate standard of excellence as we are. Messrs. Collet and Engelhardt's tools are really good examples, and when we consider that in the district from which they come machine toolmaking was unknown ten or twelve years ago, we must accord to the firm great credit for the exhibits they have turned out. Fig. 1 is a wall drill with rising table, and, of course, self-acting motion.

Fig. 2 is a slotting machine with a revolving table, self-acting in all directions; this tool has the guide bearing in the slides throughout almost its entire length. Fig. 3 is a self-acting slide and screw-cutting lathe, the sliding gear being worked on the central rack, and the screw-cutting only is done by the lateral regulating screw. It has 13in. centres, and about 10ft. bed. This is a kind of tool in which small German mechanics delight; it is a multum in parvo, in fact, sliding longitudinally and transversely, turning and boring, and cutting right and left-hand screws. Fig. 4 is a conveniently-sized planing machine with a bed of 8ft. by  $2\frac{1}{2}$ ft. The motion is by a rather quick screw in cast steel, the gearing at the end of which, as will be seen by the engraving, admits of a double speed return motion.

#### RENDERING CASKS IMPERVIOUS.

A mimproved method of treating brewers' casks, so as to render them impervious, has lately been patented by Mr. J. D. Scally, of Moorstreet, Burton-on-Trent. To this end he treats them with pure paraffin, which he applies in several ways. In one instance, he heats the cask by fire or by filling it with hot air, and then runs some melted paraffin into it, rolling it about so that the paraffin may be brought into contact with the whole of the inner surface. Supposing it to be necessary to thoroughly impregnate the pores of the wood with the paraffin, steam under considerable pressure is turned into the barrel. To effect this a steam pipe in connection with a boiler is fitted by a close joint to the bung-hole of the cask, and steam is turned on for a short period. A more elaborate, but yet more perfect way of curing casks, however, is the following, which Mr. Scally finds the preferable of the two. The cask is first heated by hot air, and then exhausted so as to form a partial vacuum inside the cask. This is easily done by applying a pipe fitted with a tap to the tap-hole in the head of the cask while the cask is hot, and connecting the other end of the pipe with an air pump, and so exhausting the cask of air. A jet or spray of melted paraffin is then admitted to the interior of the cask through the bung-hole by means of a close-fitting pipe connected with the vessel holding the melted paraffin. The hydrocarbon will then immediately fill up the pores of the wood, and will render it impervious. This will be readily understood from the processes used for preserving timber, in which cases the timber is placed in a receiver, the air exhausted, and the preserving material injected, when it is rapidly absorbed by the wood. Of course, casks can be preserved by taking out the head, heating the interior, and laying the melted paraffin on with a brush, but this is the least preferable method of the three we have described.

on with a brish, but this is the least preferable method of the three we have described.

The practical result of the application of this principle is found by Mr. Scally to be that, in the first place, the cost of filling up is avoided in breweries, all loss by absorption being prevented. Beers having to remain in cask all the summer are better preserved; the air being thoroughly excluded, the alcohol cannot acidify. Further, casks thus treated do not get fusty from wet, dirt, or exposure; the hydrocarbon being perfectly liquidigith, the germs of fust are unable to impregnate the wood. Fusty, woody, sour and stinking casks also will be cured by the application of Mr. Scally's process, as the contents of the cask will be thereby perfectly isolated from the fusty wood.

### ENGINEERING PROGRESS IN INDIA IN 1868.•

CHIEF among the characteristics of the year now so swiftly drawing to its close, is the full sanction accorded by the Government of India to the establishment of the best systems of irrigation and navigation works throughout its vast and industrial empire. It is not to be expected that the encouragement thus afforded would materially confer any benefit on the country within a few years, as such vast and gigantic schemes demand considerable time and space to produce the necessary and desired ends. It is our duty at the close of the year to which we have arrived, to do service to the country by consistent advocacy of right principles and the faithful pursuit of truth, to review the field of our united professional exertions, and to see what progress has been effected in India by our labours during the present year. The sanitary state of towns, involving the important questions of drainage, of water supply, of ventilation, the provisions of homes for the poor, and of hospitals for

• Calcutta "Engineers' Journal, December 1, 1868.

the sick, the construction of barracks for the European and native soldiery, communication of towns and of country, external and internal, by means of bridges, roads, footways, and railways, the defence of the great centrosof national life, involving questions of arms and fortification; the provisions for drought and famine, involving systems of irrigation and navigation to which we have already referred, and the direction of the intelligence and industry of the country in those channels which alone lead to a the country in those channels which alone lead to a sound and permanent prosperity, are the subjects to which, some have received careful attention, while others witnessed appreciable progress. The public mind is far more fully awake than at any former year to the importance of sanitary questions, and to the necessity of the construction of a permanent railway bridge across the Hooghly in Calcutta.

With reference to the new publishers for invited

With reference to the proposed schemes for irriga-tion and navigation in the Province of Bengal, those for the reservoirs at the river Selye in the district of Midnapore, canals of irrigation and navigation from the Damoodah river to Calcutta, systems of canals from the Gunduck river in the district of Tirhoot, navigation canal from Rajmahal on the Ganges to Calcutta, have been carefully investigated, and the preliminary surveys and levels taken during the year for the purpose of commencing with the execution of the necessary works. For the construction of the sixteen reservoirs in the district of struction of the sixteen reservoirs in the district of Midnapore, no less than 2,373 miles have been levelled, and are estimated to cost 4½ lakhs of rupees; the distributary channels at 4½ lakhs, and the entire cost of the project at 9½ lakhs. The quantity of land irrigable therefrom is estimated at 51,200 acres of paddy and 22,400 acres of cold weather crops; the entire cost of the surveying and levelling works being 8,715 rupees. The canal of irrigation and navigation from the Damoodah at Burdwan to Calcutta will be 100 miles. The surveys irrigation and navigation from the Damoodah at Burdwan to Calcutta will be 100 miles. The surveys and levels had been taken during the past year, and is estimated to cost, exclusive of works, 30 lakhs. The cost of the surveying and levelling work amounted to 17,850 rupees. The proposed canal is now in course of construction. The formation of a system of canals of irrigation and navigation from the Gunduck for the benefit of the three districts of Chumparan, Sarun, and Tirhoot, is one of the most important irrigational projects for of the most important irrigational projects for Bengal, as it would greatly relieve the distress and mitigate the horrors of famine, which is occasionally in those districts.

With respect to the project, 2,373 miles of surveying and levelling have been taken during the year; besides these, a detailed examination has been made besides these, a detailed examination has been made on both banks of the river with the view of determining the measures necessary for placing the embaukments in a complete state of efficiency. The entire cost of the work already done amounts to 25,914 rupees. The last project investigated this year in Bengal is that of a canal from the Ganges at Rajmahal to Calcutta, combining provisions for the irrigation of the district of Nuddea, and investigation into the feasibility of protecting them from the effects of such inundations as occurred last year; the work done being 454 miles of level and surveys, and its total cost 20,126 rupees. The first project taken up this year, in the province of Punjab, is for the proposed Sutlej canal, for which 1,193 miles have been levelled. The entire cost of the project is estimated at 2 crores of rupees. In the province of Oudh, 639 miles of levelling have been completed, and a rough prismatic survey of the province of Oudh, 555 miles of leveling have been completed, and a rough prismatic survey of 1,200 square miles of country finished. The result of the latter project has been the entire practicability of constructing a first-class canal for irrigation and of constructing a first-class canal for irrigation and navigation from the river Sardah, extending through the province and a portion of Bareilly and Shahjehanpore district, the entire cost of the work done being 5,000 rupees. Thus, we trust, after the careful investigation we have made for the introduction of the best systems of irrigation and navigation works throughout the important districts of India, that every successive year by the of India, that every successive year, by the judicious and diligent application of science to the our own interests, but greatly alleviate, if not altogether prevent, the horrors of drought and famine in this country.

The appointment of an eminent statistician to the office of the Imperial Sanitary Commissioner, to

The appointment of an eminent statistician to the office of the Imperial Sanitary Commissioner, to have the entire responsibility of registering births and deaths throughout the chief cities of India, anticipates well of the sanitary progress in this country. It is now a universally acknowledged fact that accurate statistics of mortality and diseases should constitute the basis of sanitary science, and are the only index of its progress. One of the chief duties of a statistician is to ascertain with precision the difference between the total number of births and deaths. and the difference between the numand deaths, and the difference between the num-ber of settlers and emigrants who come to the country to join in the great struggle for subsistence or for wealth, and of those who seek the comparative or for wealth, and of those who seek the comparative repose of a rural district after retirement from service; to these causes the actual increase or decrease of a given population is principally attributable. Another important duty connected with this office is to detect the causes of disease as arising rom drainage, water supply, and ventilation, which,

important as they are, must always be regarded among the many requisites to comfort and safety in city life.

Simultaneously with this office the Government of India has made the appointment of an experienced mining engineer in connection with the geological survey of India, for the purpose of determining with precision the mineral resources of India, improving and extending mining operations, and subsequently collecting and tabulating the mineral statistics of the country, which has been looked upon with great pleasure and satisfaction by the country at large. Taking into account the extensive geographical position of India, the economical development of its coal and iron mines, is a question of the highest importance, on which special attention and care should be exclusively devoted by the engineer on whom the appointment has this year been conferred, in order that the country should not at any time look for the supply of coal from other sources.

Regarding the construction of barracks for the accommodation of European troops throughout India, we are glad to learn, from the report of the precision the mineral resources of India, improving

India, we are glad to learn, from the report of the Inspector-General of Military Works, that the progress of works under his supervision has been, on the whole, satisfactory. Out of the entire amount of 10 crores of rupees, which have been reserved for military projects, an expenditure of 61 crores of rupees have been dealt with by the Government of rupees have been dealt with by the Government of India, with 3½ crores by sanctioned estimates, and 3½ crores by approved rough projects, and further that an expenditure of rather more than 3½ crores had been actually incurred. Nothing of any importance has been done in the province of Bengal, with the exception of the erection of new barracks for two batteries of artillery at Barrackpore, on which fair progress has been made. During the late threatened insurrection in British Burmah, several of the barracks at Thavet Myo have been completed on which fair progress has been made. During the late threatened insurrection in British Burmah, several of the barracks at Thayet Myo have been completed, and are ready for the occupation of troops in that town. In the presidency of Madras, the only important work done is the construction of barracks at Bangalore, on which considerable progress has been made. In the province of the Punjab, several of the barracks at Delhi have been completed, and have already been occupied; while at Moultan, Jullundar, and Peshawur, the progress of the works has been very satisfactory. In the north-west provinces, at Allahabad and Cawnpore, especially in the former city, great impetus has been afforded for the completion of the new barracks for a regiment of infantry and battery of artillery. In Oudh and Hyderabad, especially in the districts of Lucknow, Sectapore, and Fyzabad, great progress has been effected, while in the central provinces the improvements in the existing barracks at Jubbulpore have been completed, and at Saugor four commedious barracks are quite ready for the occupation of troops, and the new hospital for the infantry has been considerably advanced.

Regarding the Ordnance and Commissariat De-

Regarding the Ordnance and Commissariat De-Regarding the Ordnance and Commissariat De-partment, the buildings, consisting chiefly of gun-powder factories at Ishapore, are nearly completed; the gun carriage agency at Allahabad, and tannery the gun carriage agency at Allahabad, and fannery buildings at Cawnpore, on both of which considerable progress has been effected. The partial supersession of breech-loaders on an extensive scale may be regarded as a new era in the history of military engineering in India. This important invention is due to the fertile genius of Snider, and affords augmentation of approved strategic skill, and therefore gives us further impetus to the renewal of discussion on the merits of the invention. It is pretty well known that the distinguished artillerist discussion on the merits of the invention. It is was possessed of no claim whatever on the attention of the Home Government, for neither had he official connection, parliamentary influence, nor any qualification whatsoever, for dealing with a bureaucratic system. He had merely genius,—that practical genius which overcomes all insurmountable difficulties, detects a great want and private at the second which overcomes all insurmountable difficulties, detects a great want, and points out the mode of supplying it. We may well observe that the characteristic element of Snider's invention is the instantaneous extermination of a horde of combatants by the rapid breech-loading fire, having always at hand the necessary means of safety and protection to those engaged in operations. The introduction of the invention reflects great results at the extension of the invention reflects great results at the safety and protection. hand the necessary means of safety and protection to those engaged in operations. The introduction of the invention reflects great credit on the military authorities in India. Taking into consideration the actual condition of the country in a strategic point of view, it may be well to state that it is the first duty of those charged with the military defences of the country, and responsible for the expenditure of the large sums of money annually voted for that purpose, to see that at every moment we are up to the improvements of the day, to determine the best forms wood and iron can be framed for the sides of a vessel, to solve the questions whether penetration a vessel, to solve the questions whether penetration er smashing blows be the most efficient mode of er smasning plows be the most entitled induce of attack, and to decide on the best gun on either case, are points that well deserve all the care and cost for careful consideration. It is with this view that we recommend the formation of an institution similar to those in different countries of Europe, where strategic experiments are so advantageously conducted, and it is by this means at our command,

celebrated Whitworth for excellence in mechanical science is the result of that happy conception which science is the result of that happy conception which the distinguished mechanician entertains of the future pre-eminence in arts and manufactures of this country. Thus, we trust, that his munificent bequest may be followed by others in the same sphere of usefulness for encouraging the study and practice of the mechanical arts and sciences, and materially conferring benefit on the country by their absence.

Glancing over the improvements effected this Glancing over the improvements enecked the year, in railway traffic in this country, we may well state that the extension of the Punjab Railway from Delhi to Umballa, and the subsequent opening of the same by His Excellency the Governor-General in person, adds a fresh and important link of railway in person, adds a fresh and important link of railway communication in the Punjab; and, considering the character of the people we have to deal with at all times, and with the object of further increasing facilities of travelling, it is not to be wondered at that immediate steps should be taken for extending and completing the line to Lahore and other populous cities in that province.

#### REMARKS ON THE HYPSOMETER.

DR. HOOKER, in his travels in India, made extensive use of the hypnometer. D sive use of the hypsometer, and some of his remarks upon this instrument in his "Himalayan Journals" are peculiarly valuable, coming from a person of so much experience and so high a scientific authority. He says:—"The kettle used was a copper one, with free escape for the steam; it answered perfectly for all but very high elevations indeed, where from the water boiling at a very low temperature, the metal of the kettle, and consequently temperature, the metal of the kettle, and consequently of the thermometer, often got heated above the temperature of the boiling water. I found that no confidence could be placed in observations taken at great elevations, by plunging the thermometer in open vessels of boiling water, however large or deep, the abstraction of heat from the surface being so rapid, that the water, though boiling below, and hence bubling above is not puriferent of the same temperature. bling above, is not uniformly of the same tempera-ture throughout. From this it may be concluded that the boiler should be a covered vessel, made of thin metal, that the less water employed the better, that the thermometer should not have a metallic scale, but should be graduated on the tube itself; that the bulb should always be placed just above the water in the centre of the steam-space; and that the apparatus should be so proportioned as to boil the water in the shortest possible time. Good shelter and a steady fire should always be sought for. With regard to the formula employed for deducing the regard to the formula employed for deducing the altitude from a boiling-point observation, the same corrections are to a great extent necessary as with barometric observations; if no account is taken of the probable state of atmospheric pressure at the level of the sea at or near the place of observation, for the hour of the day and mouth of the year, or for the latitude, it is obvious that errors of 600ft, to 1,000ft, pay he computated. For reading latitude, it 1,000ft. may be accumulated. For practical purposes, it may be assumed that the traveller in countries where boiling point observations are most desired, has never the advantage of a contemporaneous boil-

ing-point observation at a lower station.

"The mean annual and mensual barometric pres-"The mean annual and mensual barometric pressure is now pretty well determined for every parallel of 5deg, from the equator to 60 N. and S. at sea, thanks to the labour of Maury, Fitzroy, and others; this value should, therefore, be employed in the absence of a more certain approximation to a simultaneous observation at the sea band of the statement of the seasons absence of a more certain approximation to a simul-taneous observation at the sea level, or at a lower station the elevation of which is known. If within the tropies, the mean monthly pressure should be corrected for diurnal range. The temperature of the sea level should be assumed in a similar manner when it is not absolutely known for a station of reference. When the data of the upper and an appro-priate lower stations are carefully observed with varipriate lower stations are carefully observed with priate lower stations are carefully observed with verified instruments, experience seems to prove the most complete accordance of the results of hypsometric measurements with both barometric and trigonometric measurements. With the drawbacks attending want of precise observations at a lower station, the results of Dr. Hooker's numerous calculations show that the error of the hypsometric method will be within 100ft, generally for all elevations. So impressed, indeed, was Dr. Hooker with the satisfactory results of his own observations made in 1434 50. impressed, mated, was Dr. Hooker with the satisfac-tory results of his own observations, made in 1848-50, with instruments which would now be considered objectionable, that he writes:—'For the elevation of great mountain masses, and continuously elevated of great mountain masses, and continuously enevaced areas, I conceive that the results are as good as barometrical ones; for the general purposes of botanical geography, the boiling-point themometer supersedes the barometer in point of practical utility, for under every advantage, the transport of a glass tube full of mercury, nearly 3ft. long, and cased in metal, is a great drawback to the unrestrained motion of the traveller.""—" Horological Journal."

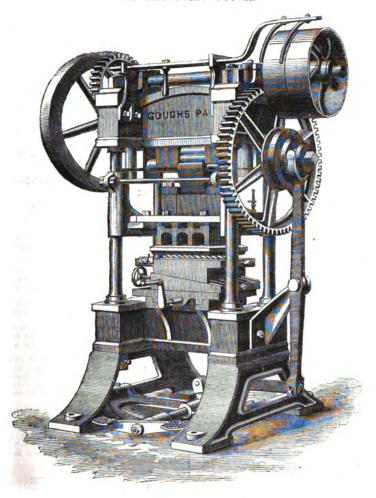
where strategic experiments are so advantageously conducted, and it is by this means at our command, that improvements in arms and fortifications can gradually and successfully be introduced.

The number of visitors to the Patent Office Museum, South Kensington, for the week ending January 16, was 6,051. Total number since the opening of the Museum, free daily (May 12, 1858), 1,482,377.



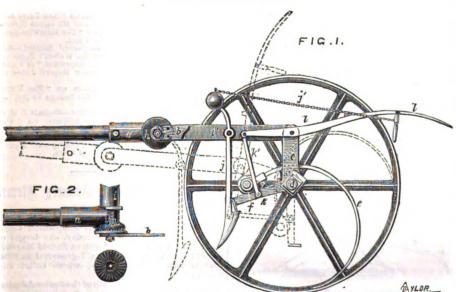
#### PATENT ROTARY ARMING PRESS.

BY MR. JOHN GOUGH.



#### HORSE RAKE.

BY MR. ROBERT BOBY.



### ROTARY ARMING PRESS.

IN our first number for the present year, we described and illustrated some improvements paper-cutting machinery, by Mr. John Gough, Kirby-street, Hatton-garden. We now place of Kirby-street, Hatton-garden. We now place before our readers particulars of another machine by the same ingenious inventor. This is a patent rotary arming press for producing devices on bookcovers, &c., and is of great importance to bookbinders. The distinctive features of this press are, facility for feeding, solidity of design and construction, and economy of floor space. Our engraving above represents a large sized press, to be worked by steam power. In this machine

the shaft carrying the strap pulleys is placed upon the top of the press. At one end of this shaft is fixed a toothed wheel geared into the flywheel, and greatly augmenting its speed. On the other end of this shaft is fixed a small pinion, geared into the large wheel running loose upon the eccentric shaft. This wheel is fitted with a clutch, sliding on the square end of the escentric shaft, which clutch is worked by the foot, and stops or starts the tool instantly. The eccentric shaft is placed under the head of the press, and the eccentric (which is a solid part of the shaft) is supported on each side by extra bearings. The working on each side by extra bearings. The working parts of this shaft which receive the pressure are in sight, and they, with the lower end of the con-

nection between the eccentric and heater box, are

self-oiled in the most perfect manner.

It will thus be seen that this apparatus embodies the distinctive features to which we have referred, and in the following manner:—First, with regard to facility of feeding, we may observe that the gauges employed are so arranged and constructed as to present a constant abutment for the case to be pushed against. The case (which requires no bending) cannot be pushed over the gauge. Less care in feeding is, therefore, necessary, and a much greater speed than with ordinary presses is obtained. The press of the large size (that shown in our engraving) is fitted with two sets of gauges, for feeding front and back, so that, with two attendants, feeding front and back, so that, with two attendants, two blocks can be worked at the same time, which renders this press equal to two of the smaller size. Next, with respect to solidity of design, it will be seen that the columns tie the head and top bearings, bed, and standards, in the most compact and rigid manner. The support at each side of the eccentric prevents deflection of the eccentric shaft. The table is supported by the sliding wedge the whole of its width, and as it is capable of resisting any pressure, the whole power of the press is concentrated upon the work instead of being wasted, as in ordinary presses, by extraneous gearing, which, while lessening their power and being wasted, as in ordinary presses, by extraneous gearing, which, while lessening their power and efficiency, increase their cost. Finally, the driving gear and machinery being placed on the head of the press, renders it clear of the usual extraneous and dangerous gearing on the floor. The press is the same front and back, is extremely simple and accessible in all its details, and occurrently and accessible in the same from the sa pies less floor space than any other arming press.

#### BOBY'S HORSE RAKE.

Nour notice of the Smithfield Club Show we stated our intention of giving detail particulars of a very good horse rake, which had been invented and patented by Mr. Robert Boby, the agricultural engineer of Bury St. Edmunds. We now append the following description, premising that the rake is so arranged as that when it is full of collected material the power of the horse is emcollected material the power of the horse is employed to raise the tines and liberate the material. In our engraving, fig. 1 represents a side elevation of a horse rake constructed according to Mr. Boby's improvements. The shafts or draught irons a are connected through link bars b b with a pair of arms c made fast to the axle d of the running wheels of the machine. The times e are mounted on a transverse round bar f, carried in front of the axle d by pairs of arms g, also affixed to the axle d, but at any convenient angle to the first-mentioned pair of arms c. In order to make the shafts or draught irons g adjustable with respect to the arms g and g on the axle (with the view of setting the times g properly to their work), they are coupled arms c and g on the axle (with the view of setting the tines e properly to their work), they are coupled to the link bars b by the intervention of two pairs of clamping discs or surfaces h, seen in the plan view, fig. 2, of one of the shafts. From a transverse bar i forming part of this coupling projects rearwards an arm i, upon which is pivoted a catch lever j. Upon this catch lever rests the horizontal arm of a crank lever k, made fast to the axle d at about the middle of its length. This lever k is connected by a like k! to a lever 1 prothe axis a at about the middle of its length. This lever k is connected by a link  $k^{\dagger}$  to a lever l provided with a handle readily accessible to the attendant. So long as the rake is required to gather, the crank lever k is held in position by the pendant catch lever j, and the pull of the horse serves merely to traverse the rake over the field. When, however, a sufficient amount of material is gathered by the tines, the attendant disengages the catch lever j by means of the chains j, and the pull of the horse then causes the axle d to rock, and the bar f carrying the tines will be depressed and caused to throw up the tines into the position shown by dots, and thus clear it of the collected material. The readjustment of the rake is effected by the attendant seizing the handle of the crank lever l, and pulling it over until the catch lever l again engages with the crank lever l. Instead of the rake being thrown into action by When, however, a sufficient amount of material is lever j again engages with the crank lever k. Instead of the rake being thrown into action ky the attendant, an attachment on the running wheel or the nave of the wheel may act upon the levers k and g, and lower the tines ready for work. Wo understand that this horse rake is in use in various parts of the United Kingdom, and proves a very settificatory implement. atisfactory implement.

CAPTAIN COWPER P. COLES, R.N., C.B., has made some experiments with a composition for preserving ships' bottoms, and also with an anti-fouling composition, which have proved highly successful. We shall have a little more to say on this subject in our



#### **Obituary.**

WE have to announce the death of Sir Henry Ellis, who has held for nearly 30 years the post of Principal Librarian of the British Museum. He was born in 1777, so that he was in his 92nd year. He received his early education at Merchant Taylors' School, whence in due course he passed as a scholar to St. John's College, Oxford. He took his degree at the end of the last century, and was elected to a Fellowship. He was appointed principal librarian of the Museum in 1827, and was for many years one of the most active members of the Society of Antiquaries. In middle life, he was indefatigable as an author; among the most valuable of his publications are his "Original Letters Illustrative of English History, with Notes and Illustrations," mainly from the autograph originals in the British Museum, the State Paper Office, and other sources. We also have to announce the death of Mr. C. R.

Weld, late assistant secretary to the Royal Society from a sudden attack in the region of the heart, which happened a few days since, at his residence, New Bridge-hill, near Bath. He was in the 56th year of his age, having been born in 1813 at Windsor. He was the son of Mr. Isaac Weld, of Dublin, where he was educated, and was called to the Bar, at the Middle Temple, in 1844. In 1845 the Bar, at the Middle Temple, in 1844. In 1940 he was appointed assistant secretary and librarian to the Royal Society, and held that post for upwards of 15 years. He was known as the author, interesting the Boyal Society," pubof 15 years. He was known as the author, interalia, of "The History of the Royal Society," published in 1847; "Auvergne, Piedmont, and Savoy," in 1848; "A Vacation Tour in the United States and Canada," in 1854; "A Vacation Tour in Brittany," in 1856; "A Vacation in Ireland," in 1858; "The Pyrenees, East and West," in 1859; "The Highlands, Orcadia, and Skye," in 1860; "Sketches in India," in 1862; "A Winter in Rome," in 1865; "Florence, the new Capital of Italy," in 1867; besides which, he was the author of soveral pamphlets on subjects connected with of soveral pamphlets on subjects connected with Arctic explorations.

#### Correspondence.

GRINDING CORN.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE.'

GRINDING CORN.

SIR,—The statement on this subject, transferred to your columns from the "Agricultural Journal," only proves what barbarous means are sometimes adopted in order to perform the most simple mechanical operations. The system of nine-story millstones is a fair sample, and shows that the remote city on the Danube is much more abundantly supplied with labour and materials than with true mechanical knowledge. Your further statement that chemical science proves that the outer integuments in which the fine flour is enveloped, contains the elements required for building up the animal frame, is true, so far as chemistry is concerned, but you omit to state that, even if those integuments be ground to fine powder, they cannot be assimilated in the human stomach as they are in that of graminivorous animals, who increase in museular power and fat, when fed upon dry hay alone, a food upon which we could not exist, much less thrive. It is, therefore, utter waste to fill our stomach with ground bran, which is much more profitably employed for animal food; but, as white flour and bran have opposite qualities, the former being constipating and the latter opening, the best plan is to make use of both white and brown bread alternately, a practice that will obviate the necessity of having frequent recourse to aperient medicines.

The practice followed at the Hatcham Mills by

The practice followed at the Hatcham Mills by the Messrs. Chapman and Co., though of course protected by Royal letters patent, is nearly as bar-barous as that in use at the Hungarian mills of Pesth, for they might just as well grind up wood, parous as that in use at the Hungarian mills of Pesth, for they might just as well grind up wood, fibre, and bark, as is the custom in Sweden and Norway, when cereals are scarce. A small portion of the inner integuments of the grain, ground fine with the flour, make very good and wholesome brown bread, but the best is made with a mixture of wheat and rye ground together. In the matter of grinding corn, as exclusiveness is a main object of manufacturers of every description, a host of very use-less patents are continually being taken out, merely with the view of excluding others from following the same process, while it should always be borne in mind that all patent and advertising expenses must ultimately be paid by the consumer in some shape or other. The antagonistic patents for ventilating and dressing millstones are properly arranged they will ventilate themselves; and in regard to dressing, twenty minutes for each face is ample time for the operation by hand.

Our bread, especially from first-class bakers, is beautiful to look at, but we shall never obtain good sound bread until a certain kind of compact between the miller and baker be broken up—that is to say, the baker will not purchase flour from the miller unless it will carry a certain customary amount of water to the sack. Consequently, the miller will never purchase much new as long as he can obtain old wheat, which has been stacked some years in the rick to heat and sweat, as he calls it. The tobacco manufacturer tells the same tale, that he must make up the leaf into enormous bales in order to heat and sweat, whereas the pure leaf, merely must make up the leaf into enormous bales in order to heat and sweat, whereas the pure leaf, merely damped for cutting, makes by far the finest smoking tobacco, but he will produce nothing of the kind. New wheat, when thoroughly dry, undoubtedly makes the best bread, but the flour from new wheat will not carry nearly so much water as that from old, hence the preference of the baker for the flour of old wheat, and also the introduction of alum by both the miller and baker, in some shape or other, in order to produce a loaf that may look "beautiful for ever," with an undue proportion of water concealed in it. of water concealed in it.

of water concealed in it.

I cannot agree with the observation of the Messrs. Chapman, that millstone grit is ever found in good bread, for the wear of the stones is in the dressing, and not in the grinding operation. I forbear to trespass upon your space on this subject, more especially as I have repeatedly described the best processes in various public prints, as far back even as the year 1824.—I am, Sir, yours, &c.,

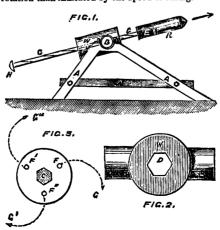
HENRY W. REVELEY.

Reading, January 18.

[As the world is ever ready to learn, and ever prone to forget the lesson taught, we think our correspondent would be doing the public a service by sending us a few more remarks on the best processes of dressing corn and converting it into food; at any rate, we shall feel obliged to him.—Ed. M. M.]

#### WAR ROCKETS.

SIR,—On reading the article on war rockets, by Mr. James Nasmyth, C.E., in your number of January 15, I came to the conclusion to give publicity to an invention I made some time ago. I am quite of Mr. Nasmyth's opinion that axial rotation for firing elongated shot is not only a desideratum, but a capital point. I however, venture to say but a cardinal point. I, however, venture to say that Mr. Nasmyth is no artillerist, otherwise he would not have invented for war purposes such a complicated and easily deteriorating machine for firing war rockets as he has. It is a desideratum in artillery to have instruments of the most simple in artillery to have instruments of the most simple and manageable construction, giving the greatest amount of force and precision obtainable. And this is not the case with that of Mr. Nasmyth, however ingenious the principle may be. We have in our artillery war rockets which rotate; they are on the principle of the "skew hole" system. I am opposed to that principle for war rockets, as the rotative force is, in a certain sense, dependent upon the atmosphere, and it is not possible to control the flight of the projectile (rocket). I object to the statement of Mr. Nasmyth that a rocket, to obtain the necessary flight and precision. must possess the ment of Mr. Nasmyth that a rocket, to obtain the necessary flight and precision, must possess the highest degree of axial rotation. Such an enormous rotation will give as a resultant an enormous deflection (perhaps normal), which is not easily corrected. Besides this, my opinion is that uniform rotation is necessary for accuracy, not that I mean a projectile must have the same number of revolutions on each point of the parabola described by it, but that the commencement of rotation must be the same for all at the moment of leaving the gun. I am but that the commencement of rotation must be the same for all at the moment of leaving the gun. I am strongly opposed to the idea of artillerists, that a gun rifled at such and such a speed gives to the projectile one rotation at such and such a distance. A projectile leaving a rifled gun gets a greater rotation than indicated by the speed of rifling.



To return, however, to my invention. I beg to enclose you rough sketches of a firing carriage,

which I believe meets every requirement for firing rockets without sticks. The sketch is to be taken only as an indication of my invention, and the rockets without sticks. The sketch is to be taken only as an indication of my invention, and the description of the modus operandi only as general. In fig. 1, A A is the carriage, B B the trunnions; C is a rod in the form of a helice, passing through the hexagonal opening D, fig. 2, and working like a piston rod through W, which is rifled like the Whitworth gun. At one end of the rod C is a hollow cylinder E, fig. 1, into which is inserted the rocket R, so as to secure aim. The rocket is held in check by springs until the combustion of the charge has generated sufficient force to pull forth the rod C, and to give, by the rotation of the rod, the desired effect to the rocket; H is a check for retaining the rod C after the projectile has left the cylinder E, while it facilitates the expulsion of the rocket. Fig. 3 represents the rear end of the cylinder or tube E, with the rod C C attached to it. F F' F' are circular holes to let out the propelling gases, and which are so constructed that those gases go in the direction of the helice C C. This screwlike propulsion helps the rotation obtained by the working of the rod C C through W.—I am, Sir, yours, &c., Delft, January 17.

A. DE B.

#### TO CORRESPONDENTS.

THE MECHANICS MAGAZINE is sent post-free to subscribers of £11s. 8d. yearly, or 10s. 10d. half-yearly payable in advance.

advance.
All literary communications should be addressed to the Editor of the MECHANIOS MAGAZINE. Letters relating to the advertising and publishing departments should be adressed to the publisher, Mr. R. Smiles, MECHANIOS MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, ED, M. M.

faith, ED, M. M.
Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 6d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists
of about 10 words. Woodcuts are charged at the same rate
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#### Meetings for the Meek.

-Royal Institution.-Mr. Westmacott, on "Fine

Tues.—Royal Institution.—Mr. Westmacott, on "Fine Art," at 3 p.m.

British Horological Institute.—The Half-Yearly Meeting, at 8 p.m.

The Institution of Civil Engineers.—Mr. Henry Hopper, Assoc. Inst. O.E., on "New Ferry and New Brighton Piers"; and Mr. James Robert Mosse, M. Inst. C.E., on "The Mauritius Railway, Midland Line," at 8 p.m.

WED.—Civil and Mechanical Engineers' Society.—Adjourned Discussion on Mr. Walton's Paper on "The Greenock Docks Competition," at 8 p.m.

THUES.—Royal Institution.—Professor Rupert Jones on "Entozoa," at 3 p.m.

FRI.—Royal Institution.—Mr. Ruskin on "The Flamboyant Architecture of the Somme Valley," at 8 p.m.

8 p.m.
Royal United Service Institution.—Captain J. R. C.
Colomb, Royal Marine Artillery, on "The
Distribution of Our War Forces," Part II.,

SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

### Rabal, Military, and Gunnery Items.

AT the official trials of the proposed new small arm, by the Breech-loading Riffe Competition Committee, at Woolwich, last Tuesday, one target of 2.28 was made at 1,200 yards with an Enfield Martini-Henry riffe. The riffing was a 7-groove, 1 in 22in. uniform twist, by Mr. Henry, whose bullet and lubrication were also used.

WE have to record the death of the Senior Admiral of Her Majesty's Fleet and of the Bristish Navy, Admiral Sir Lucius Curtis, K.C.B., yesterday week, at his residence, at the foot of the southern slopes of Portsdown-hill, near the village of Cosham, and within view of Portsmouth, where he first entered the service, nearly 74 years ago.

within view of Portsmouth, where he first entered the service, nearly 74 years ago.

The works on St. Catherine's Rock Fort, near Tenby, are being successfully proceeded with. During the past two months, the weather has been so stormy that considerable difficulty has been experienced in procuring and landing granite and other materials, but this is now to a great extent obviated by improved extragements.

by improved arrangements.

On Tuesday week, a handsome building was publicly opened in Ocean-street, South Shields, and dedicated as a free college for the education of seamen in navigation, and all the branches of scientific



knowledge useful in their calling. The Rev. Dr. Hooppell, of St. John's College, Cambridge, is the head master.

THE United States Secretary of War has issued an THE United States Secretary of War has issued an order directing that mammoth powder only be used in firing the 15-inch guns, the use of any other being expressly forbidden until means for checking the recoil are applied to all carriages. It is ordered that no charge greater than 501b. of mammoth powder be used without instructions from the Ordnance Office. The Chassis rails are to be well searched in all firing

ordnance Office. The Chassis rails are to be well sanded in all firing.

A HANDSOMELY-FITTED steam launch, for the use of Admiral Hobart Pasha, on the Bosphorus, has just been shipped to Constantinople, by Yarrow and Hedley, the builders. The boat is 40ft. in length, cift. beam, and has a draught of 2ft. Sin. She is fitted with engines of 7 (nominal) horse power, capable of working up to 20. A cabin extends from end to end of the launch, divided amidships by a movable partition—the forward part possessing ample sleeping, &c., accommodation for three persons; the after part being allotted to the machinery. The boat is elegant, and commodious for river or harbour work. She is shipped all complete, so that on arrival at her destination, she has merely to be lowered over the ship's side, get up steam, and assume her full duties. duties

the ship's side, get up steam, and assume her full duties.

The Prussian "Military Gazette" says that the German military organization is now complete and that "a million of soldiers, can at any moment be placed under arms by a single telegram form Berlin." The Prussian troops, it adds, consists of 325 battalions of infantry, 268 squadrons of cavalry, 11 regiments of artillery, with 1,146 guns, and 12 battalions of engineers, making 410,000 soldiers in all. To these, says the "Pall Mall Gazette," should be added the Federal contingents, which are as follows:—Saxony, 29 battalions, 24 squadrons, 96 batteries, and 6 guns; Brunswick, 3 battalions, 4 squadrons, and 6 guns; Mecklenburg-Strelitz, 1 battalion; and Hesse Darmstadt, 10 battalions, 8 squadrons, 24 guns, and 1 battalion of engineers; total, 53,000 men. But, says the "Military Gazette," this force of 463,000 men only represents the standing army of North Germany. "In cases of emergency, Prussia can also command the services of the troops of Baden, Wurtemburg, and Bavaria, and immediately order a levy of her reserve, consisting of 120 battalions of infantry, 76 squadrons of cavalry, 240 guns, and 12 battalions of engineers; or an army of 143,000 men. An additional force of 200,000 men is at her disposal for the occupation of towns and garrisons. The above numbers do not include the officers, military train, military labourers, nor special corps of any kind." train, military labourers, nor special corps of any

tran, mintary labourers, nor special corps of any kind."

An article on the new firearms, published by the "Journal Official," says:—"The result of a comparative trial which took place in the School of Musketry, at Spandau, in Prussia, amongst the breech-loaders adopted by the different armies, were, according to the official report, the following:—The Prussian needle gun can fire 12 shots a minute, the Chassepot 11, the Snider 10, the Remington (Denmark) 14, the Peabody (Switzerland) 13, the Wonzi (Austria) 10, the Werndi (same State) 12, and the Winchester repeating rifle (United States) 19.

The breakwater constructed some years ago in St. Catherine's Bay, Jersey, for the purpose of a naval station, but which has remained wholly unused ever since, has just been offered by the Government to the island authorities, on condition that they will add the necessary works to convert it to a harbour. The offer is opportune, because the States contemplate providing a deep-water harbour, the absence of which is specially inconvenient to the mail packets, and a hindrance to passenger traffic. It is proposed,

which is specially inconvenient to the mair packets, and a hindrance to passenger traffic. It is proposed, if a deep-water harbour can be secured cheaply, either at St. Catherine's or elsewhere, to connect it with St. Helier's by a short line of railway, or, on the other hand, by a road tramway.

#### Mistellanea.

WE are glad to observe that the efforts made towards the art education of the working men in all countries multiply daily. The municipal council of Brussels, aided by a vote of the Belgian Chamber, has reorganized its industrial museum, and opened a school for the artistic education of workmen.

A TRIEGRAM from San Francisco states that during the last half of 1868 that port exported 150,000 tons of wheat and 240,000 barrels of flour, and in the aggregate to an export of 184,000 tons

equal in the aggregate to an export of 184,000 tons of wheat. The amount of wheat still on hand is estimated at 180,000 tons in California and 80,000

esumated at 180,000 tons in California and 80,000 tons in Oregon.

DURING 1868 the total number of immigrants landed at New York was 212,989, a decrease of 29,772 as compared with the previous year. There were 4,861 arrivals of vessels at New York from foreign ports in 1868, as compared with 4,976 arrivals during 1867. Of these arrivals in 1868, the American 67. Of these arrivals in 1868, the American ssels numbered 2,395, the British 2,082, the North

German 379, and the French 29
The Post-office in the Rue Jean-Jacques-Rousseau ordinarily receives about 20,000 letters each evening

from 5 to 6 o'clock, but on the eve of New Year's Day not less than 200,000 passed through its offices between those hours. The administration distri-

between those hours. The administration distributed 3,000,000 of visiting cards this season, and, notwithstanding the assertion that the fashion is dying out, there is an increase for the present year.

THE election of a foreign member of the Paris Academy of Beaux Arts, in the place of the late composer Rossini, has fallen on Signor J. Dupre, sculptor, of Florence, Signor Dupre exhibited in the Champ de Mars, in 1867—"Piety" a group in marble; "The Infant Bacchus," a statuette; and "The Triumph of the Cross," bas-relief in plaster; and was awarded by the jury one of the grand prizes. prizes

and was awarded by the jury one of the grand prizes.

In a communication to Paris, M. de Lesseps states that a small schooner, "La Levrette," has recently passed through the Suez Canal, and that six vessels belonging to the Egyptian fleet are about to pass from one sea to the other. It now may be safely said that this canal is opened for vessels of small tonnage; and in six months' time ships of from 2,000 to 3,000 tons burden will be able to make use of the Suez Canal.

The Parliamentary deposit on the proposed new line to Brighton has not been paid, and the project has thus, for the present, been abandoned. It appears that as many as five petitions against the bill, on the ground of non-compliance with standing orders, had been lodged in the Private Bill office of the House of Commons—one by the Brighton Company, one by the South-Western Company, and three others nominally by private individuals.

The progress of the St. Marylebone Bank for Savings, during the past year, has been of a satisfactory description, as appears from the following statement just issued:—Received from 1,726 new and 16,337 old depositors, £83,039 0s. 7d.; repaid to 8,248 depositors in part and 1,400 in full, £78,100 16s. 3d. Increase, open accounts, 326; money, £4,938 4s. 4d. Number of accounts remaining open, 32,973; amount

15,337 old depositors, £83,039 0s. 7d.; repaid to \$,248 depositors in part and 1,400 in full, £78,100 16s. 3d. Increase, open accounts, 326; money, £4,938 4s. 4d. Number of accounts remaining open, 32,973; amount due, £313,633 12s. 7d.

The number of visitors to the South Kensington Museum during the week ending January 16, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 16,576; Meyrick and other galleries, 3,362; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 2,277; Meyrick and other galleries, 317; total—22,532. Average of corresponding week in former years, 9,899. Total from opening of Museum—8,073,624. A CLERGYMAN, whose name is stated to be Mr. Wild, has been lecturing in Canada, taking for his subject "What the world is coming to." He announces these among other things looming in the distance:—Coral insects will fill up the Pacific with solid habitable land; eventually the globe will be all land, or at least there will be no more sea; there is also to be perpetually equal day and night of twelve hours each all over the globe; there is to be only one language spoken throughout the world, and wither frequence will be English"

twelve hours each all over the globe; there is to be only one language spoken throughout the world, and "that, of course, will be English."

The other day, while engaged in digging the foundations of the new Home for Sailors' Orphans between Church-row and High-street, Hampstead, a working man came upon a leaden coin, about 2ft. below the surface, in a bed of loam and clay. It is about 1½in. in diameter, and on inspection it turns out to be a "bull" of Pope Innocent IV., one of the well-known family of Fiesco, who sat in the chair of St. Peter from A.D. 1243 to 1255. The "bull" bears on the reverse the figures of St. Peter and St. Paul, and is in a tolerable state of preservation; and we understand that it is likely to be secured for the British Mussum. the British Museum.

the British Museum.

THE Society for the Encouragement of Mandfactures and Mechanical Industry in the Netherlands proposes to arrange an international exhibition of articles for daily household use, at Utrecht, in the months of August and September, 1869. The principal object of this exhibition is to bring to the knowledge of the workman such articles of household use, furniture, dress, food, work, and instruction of different countries, as at a low price, combine use, lumiture, gress, 100d, work, and instruction of different countries, as, at a low price, combine usefulness and solidity, so that he may be enabled, by judicious economy, to improve his condition. Articles of luxury, as well as of elegancy, strictly so called, are excluded.

called, are excluded.

THE gold diggings in the Strath of Kildonan and the Seisgill Burn are attracting large numbers of treasure-seekers. No nuggets of any great size have been got, but a number of people have succeeded in getting quantities estimated in some instances as high as to pay them from 5s. to 30s. for their day's work. The gold is got in small particles in the alluvial soil washed down from the mountains by the river; and in consequence of the swollen state of the streams at present this is the most unfavourable system for prosecuting the search. It may, of the streams at present this is the most unavour-able system for prosecuting the search. It may, and doubtless will, happen that the net gains of the parties engaged will dwindle down considerably when they come to be tested; but at present the belief is strong in the district that the gold washing

and placed under an experienced mauager, every precaution being taken for the exercise of rigid economy. The result appears to be that there is already a steady outturn of coal, and that attention is being paid at Singapore and elsewhere to its valuable peculiarities for steam and gas purposes. At the same time, the working even on its present scale has been brought to yield a surplus over expenses. The latest accounts confirm the impression that the quantity available is practically inexhaustible.

scale has been brought to yield a surplus over expenses. The latest accounts confirm the impression that the quantity available is practically inexhaustible.

At a general meeting of the Royal Horticultural Society, held on Tuesday last, Mr. James Bateman, F.R.S., vice-president, in the chair, the following candidates were elected fellows of the society, viz:—His Serene Highhess the Prince Teck, His Highness the Prince Hassan Pacha, Mrs. Wm. Butt, Henry Cannell, Hon. Richard Walter Chetwynd, Lord Alfred Spencer Churchill, Arnold de Baruchsen, Mrs. Henry Fenwick, Rev. Frederick Leicester Viscount Milton, M.P., W. R. Morris, George Lake Russell, Rev. Sanderson Tennant, Miss Thompson, Frederick J. Toulmin, Hugh F. Underwood, Henry Jones Winsett. &c. This was the first of the society's scientific meetings, and a very fine collection of plants and fruits was brought together. The total quantity of coal imported into France, in the first nine months of 1868, was 4,748,213 tons, as compared with 4,874,667 tons in the corresponding period of 1867, and 4,846,610 tons in the corresponding period of 1867, and 4,846,610 tons in the corresponding period of 1867, and 4,846,610 tons in the corresponding period in the france to September 30, 1868, 1,299,301 tons came from the United Kingdom, 2,582,887 tons from Belgium, and 860,319 tons from the Zollverein. In the first nine months of 1867 the corresponding receipts stood thus:—From the Zollverein, 851,901 tons.

A census of Chicago, taken on the 1st of October, 1868, shows its population to be 252,054, an increase of 51,636 since the census taken two years before. Chicago has just completed, ready for opening to the public on New Year's Day, a tunnel under the river which flows through the city. The contract price of this work was 328,500 dollars. The length is about 1,605ft.; of the retaining walls of the open approach on the west side about 320ft., and 275ft. on the east side. The length of the main archway, or covered way, is 932ft. There are three archways leading through

### Patents for Inbentions. ABRIDGED SPECIFICATIONS OF

**PATENTS** THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

ment:—
BOILERS AND FURNACES—2166
BUILDINGS AND BUILDING MATERIALS—2139, 2149
CHEMISTRY AND PHOTOGRAPHY—2136, 2157
CULTIVATION OF THE SOIL, including agricultural implements and machines—2170
ELECTRICAL APPARATUS—2160
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2148, 2154, 2161
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2131, 2134, 2144
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—
None.

time-Rospers, 7.
None.
GENERAL MACHINERY—2146
LIGHTING, HEATING, AND VENTILATING—None.
METALS, including apparatus for their manufacture
2129, 2137
2125, 2126, 2127, 2130, 2132, 2133, 21

2129, 2137

MISORLIANEOUS—2125, 2126, 2127, 2130, 2132, 2133, 2135, 2138, 2138, 2138, 2138, 2138, 2156, 2159, 2162, 2163, 2164, 2167, 2160, 2161, 2162, 2163, 2164, 2165, 2167

ROADS AND VEHIOLES, including thiway plant and carriages, saddlery, and harness, &c.—None, SHIPS AND BOATS, including their fittings—None.

STEAM ERGINES—2128, 2146

WARFARE—2155, 2169

when they come to be tested; but at present the belief is strong in the district that the gold washing will pay.

Advices from Labuan give at length satisfactory prospects of the working of the coal mines at that island. After the break up of the China Steam and Labuan Coal Company, the property was bought for a small sum by a few meu of business in Scotland



2125 A. KANE, Dundee. Tobacco-pipe apparatus. Dated July 3, 1868.

2125 A. KANE, Dundee, Tobacco-pipe apparatus. Dated July 3, 1868.

The patentee makes the mould of the pipe in halves, and holds them in a cramp. The two creeks of the mould are pressed together by a screw. To a lever a stopper or piston is attached, so that when the lever is pressed down-wards, the stopper or piston enters the part of the mould where the head or bowl of the pipe is formed, and forces the clay which has been placed therein. The bore or tube in the "staple" of the pipe is formed by a wire which is fixed to a guide block and actuated by a rod connected to the end of the lever.—Patent abandoned.

2126 J. H. JOHNSON, Lincoln's Inn-fields. Paper pulp. (A communication). Dated July 3, 1868.

The patentee proposes to apply in the vat containing the pulp, and in proximity to the cylinder ordinarily employed, an additional apparatus to feed the pulp between the teeth or blades of the cylinder and those of the block in lieu of causing the cylinder itself to agitate, and thus effect the supply of the pulp as well as effect it trituration, as in the ordinary manner. The feed apparatus may consist of a drum provided with pallets, or a pump or other apparatus, suitable for the purpose intended. The cylinder being elevated above the pump is not required to overcome the resistance to which it is ordinarily subjected, and as the power expended in feeding is but small, a considerable saving in motive power is effected.—Patent completed.

saving in motive power is effected.—Patent completed.
2127 G. BENNETT and J. WOODGOCK, Manchester. Railway communication. Dated July 3, 1868.
A revolving fan is employed to create a current of air, the fan being worked from the axle of the engine or carriage, the air may be applied to sound a whistle or other alarm outside the carriage from which the communication is desired.—Patent completed.

13 desired.—Faten completed.

2128 J. and G. M. WARD, Gorton, Lancaster. Locomotive engines. Dated July 3, 1868.

This invention consists in the employment of an air valve in communication with each steam chest for supplying air to the chests and cylinders when the pistons and slide valves are working with the steam shut off.—Patent abundance. abandoned.

J. B. Brown, Northumberland. Calcining ores

stide valves are working with the steam shut on,—Fatent abandoned.

2129 J. B. Brown, Northumberland. Calcining ores. Dated July 3, 1868.

The ordinary way of heating a close furnace is by passing the flame between the two arches at the top of the furnace and then once or oftener under the tiles which form the bottom of the furnace. This invention consists in converting the space between the two arches into an open furnace to which the ore or mineral is first supplied; the ore afterwards descends into the space below the lower arch, which space forms the close furnace. The invention is carried out by levelling the top of the lower arch so as to form an upper bed to receive the ore or mineral; this lower arch is strengthened, if necessary, and the distance between the two arches must be sufficient to allow the ore to be worked on the upper bed or top of the lower and,. The flame passes first over the ore on the upper and open bed and then under the ordinary lower bed to the chimney. By means of this the patentee is able to get rid of any excess of sulphur on the upper bed before adding common salt or other chloride to the ore in the lower bed or close furnace; the gases from the two beds are kept separate and distinct, those from the lower bed being collected and condensed, if necessary, should it be desired that the ore on the upper and open bed be subjected to a lower degree of heat than when in the lower bed on lose furnace, this can be effected by causing the flame from the fuel to pass under the tiles of the lower bed, then between the arch of the lower bed and then ascending to pass over the ore on the floor of the lower bed, then between the arch of the lower bed and a set of tiles made to form the floor of the hour bed, then between the arch of the lower bed and then finally over the ore on the upper bed, and then finally over the ore on the upper bed to the chimney.—Patent completed.

2100 W. E. Newron, Chancery-lane. Automatic toys. (A communication). Dated July 3, 1868.

and then finally over the ore on the upper bed to the chimney.—Patent completed.

2130 W. E. Newton, Chancery-lane. Automatic toys.
(A communication). Dated July 3, 1868.

The automaton toy which forms the subject of the present invention is constructed to represent a human figure or mechanical man capable of driving a carriage before him, the legs of the fluure being made to move as if walking. The patentee claims, first, the construction of the leg of a toy adapted to imitate the movements of the natural leg, the general arrangement and construction of parts, and particularly the attachment of a bar to the foot at a point in advance of the point of attachment of the foot bar. Second, the frame and hip plates to which the legs are attached, and by means of which the legs are connected with the body of the toy, as described. Third, the construction of the legs and feet, or movable parts of the toy, whereby, when the toy is moved over the foor, the parts are caused to imitate the movements of the corresponding parts of the natural limb which it is designed to represent.—Patent completed.

2131 M. HENRY, Fleet-street. Provision cases. (A com-

sponding parts of the natural limb which it is designed to represent.—Patent completed.

2131 M. Henny, Fleet-street. Provision cases. (A communication). Dated July 3, 1868.

The case is made of tin, tin plate, or other like metal, on which a varnish or coating is applied and fixed by heat or otherwise, thereby preserving the metal from oxidation, and the contents from discoloration and injury. Various varnishes or coatings may be used, but the one preferred consists of gum copal, linseed oil, and essence or spirit of turpentine. In the bottom of the box or receptacle is an oritice or hole through which the jam or other provision is inserted, and when the receptacle is filled, the hole is closed by a cap or stopper which may be provided beforehand, or with solder or cement, so as to fasten it instantly by heating it over a soldering iron. The cover overlaps the rim, and its flange or lip drops over a neck or recessed part of the receptacle, and a ring or guard is placed round it of sufficient length to facilitate its removal when the box is to be opened. The bottom of the box is made convex towards the outside or under side. When the contents of the receptacle are poured in in a hot state, they shrink as they cool, producing a vacuum or partial vacuum inside the receptacle, so that the bottom yields under the external pressure, or assumes a flat or a concave form, being pressed inward by the atmospheric pressure against the contents, which it packs tightly.—Patent completed.

2132 J. A. MULLER, Amsterdam. Gas meters. Dated July 4, 1868. This relates to an improved meter for regulating and

This relates to an improved meter for regulating and registering the flow of liquids and gases, and the said meter consists of a hollow cylindrical chamber in which works a water and air-tight piston or disphragm, the cylinder having a cover at each end, provided with a stuffing box, through which a tappet works, the tappet in

the top cover being operated upon by the ascent of the piston or disphragm, and the tappet in the bottom cover by the descent thereof. Both at the top and bottom of the cylinder is a port for the admission of the liquid or gas, and opposite to these ports are other ports for the exit of the liquid or gas; valves or slides actuated by levers in communication with the tappets operated by the piston or disphragm are worked over these parts in their respective valve cases in such manner that the liquid or gas is admitted alternately to the top and bottom of the cylinder, thus accurately regulating the supply thereof. By means of cog wheels and pawl and ratchet, or other equivalent gear, in connection with the tappets operated by the piston or disphragm, the supply of liquid or gas can also be accurately registered on an ordinary indicator.—Patent completed.

2133 J. Head, Middlesborough. Furnace grate.

2133 J. Hrad, Middlesborough. Furnace grates. Dated July 4, 1868.

This invention has reference to that class of grates known as stop grates, that is, such as have the grate bars arranged one above the other, upon an inclined plane. By this invention each bar is supported upon two or more shanks or levers, which can be projected downwards at right angles to the bar. These levers or shanks, if of wrought iron, should be swaged down somewhat smaller at the upper end, and inserted into holes cast or otherwise made in the bar, which should be of cast iron. They can be further secured by wedging or tiveting, if desired, or they may be cast upon the bar, as hereafter described. A few inches below the bar a hole is made in the shank, through which a bolt or pin is inserted, attaching it to the frame, and which carries the weight of the bar, leaving it free to turn upon the pin or bolt in an arc of a circle. A few inches below this hole in the shank another hole is provided, containing another bolt, which attaches the extremities of all the shanks. The bars are cast with shanks and projecting pins or centres. The upper pins rest in notches in the frame for easy removal, and the connecting bars hook on to the lower pins. The bars are cast with shanks and projecting pins or centres. The upper pins rest in notches in the frame for easy removal, and the connecting bars hook on to the lower pins. The bars are supported upon a carriage or bogle, formed of a piece of iron and supported upon two wheels, which run upon light rails near the floor of the ashpit. The wheels are placed so that when the grate is at its proper inclination, they are nearly in the line of its centre of gravity. The frame can be continued outside the furnace, and be connected by a long bolt running through a wooden strut and raise or lower or draw in and out, or otherwise. The attendant can take hold of this wooden strut and raise or lower or draw in and out, or otherwise. The attendant can take hold of this wooden strut and raise or lower or draw in an 2133 J. HEAD, Middlesborough. Furnace grates. Dated July 4, 1868.

This invention has reference to that class of grates

backwards upon the wheels.—Patent completed.
2134 A. Fayer, Manchester. Concentrating sugar. Dated
July 4, 1868.

The patentee passes the gases or products of combustion,
either with or without an admixture of air, between a
series of spiral blades or volutes symmetrically arranged
and revolving round a common centre. The external
edges of these blades, in their lowest position, are immersed in the solution to be operated upon, and by their
revolution, the solution flowing over their surfaces towards
the common centre preserves the surfaces in a moist
state. The heated gases passing over these moistened
surfaces effect the concentration desired.—Patent completed.

state. The nested gases passing over these indisates surfaces effect the concentration desired.—Patent completed.

2135 A. Albini, Genoa. Compasse. Dated July 4, 1863. Under the usual compass card the patentee fixes a metallic ring divided on its under side into the same number of points as and corresponding to those of the compass card. At each division the ring is engraved with one or more letters, figures, or conventional signs, to indicate the compass points, and capable of answering as printing types. The compass card fitted with the ring is suspended in the usual way upon a central pointed support fixed upon a metallic frame containing clockwork arrangement. On the face of one of the frame plates is a clock dial to indicate the time, and on the opposite frame plate is a piston or roid geared to the clockwork, and made by its action to rise and fall at fixed intervals. The upper part of the piston or sliding rod is bent at right angles, so as to project above the card ring. On the bent part of the sliding rod a small metallic point is fixed vertically, the point being fitted with a spiral spring. Fixed on the front frame plate, and at the back of the sliding rod, is a small horizontal elastic cushion, and in the same line, is fixed as small horizontal plate, carrying in its centre a small well filled with a suitable coloured liquid, and a little above the plate a narrow silk ribbon or other material is fixed, one end dipping in the well and the other end being fixed to a metallic support at the further end of the elastic cushion, the ribbon being supported a little above the surface of the said cushion. The apparatus is suspended on gimbals, to allow for the motion of the ship.—Patent completed.

2138 A. M'NIEL and W. Weerlann, Exeter. Salts of ammonia. Dated July 4, 1868.

to allow for the motion of the ship.—Patent completed.
2186 A. M'NIEL and W. WHEATON, Exeter. Salts of ammonia. Dated July 4, 1868.

The patentees take the ammoniacal liquor as it comes from the gas works, and add thereto gypsum or sulphate of lime (by preference reduced to a coarse powder) in the proportion of, say, 100lb. or 200lb. to 100 gallons of gas liquor, and they allow the gypsum to remain in the liquor for two or three weeks. The sulphate of ammonia thus formed will be found dissolved in the water, which, when properly saturated, may be drawn off and evaporated, and the dry substance thus obtained in a state of powder will be found to form an excellent manure.—Patent abandoned.

appears in nature or is artificially produced) is at first init mately mixed with a suitable hydrocarbon, such as gas tar, resin, petroleum, or any other analogous substance, in sufficient quantity to produce with it a stiff paste. This paste, after having been made into small balls or other suitable shapes, is dried in the air or in a drying oven, and then charged into a strong tube or retort, which is to be lined with a plumbago coating, and heat applied to it. This tube or retort must be of sufficient strength to stand a pressure of 25lb to 30lb. to the inch while exposed to a red heat, and be so arranged that by means of a safety tube or valve, the necessary amount of hydrocarbon gas can be introduced into the retort among the heated mixture, and the pressure of from 20lb, to 30lb, to the line maintained therein. To accomplish this, the hydrocarbon gas is evaporated by gentle heat from liquid hydrocarbon, and pumped by a force pump into the retort or tube, and as the gas is consumed, the supply is maintained at the requisite pressure by the pump.—Patent completed.

2138 R. Needham, Dukinfield, Chester. Feed scater appears in nature or is artificially produced) is at first inti

as the gas is consumed, the supply is maintained at the requisite pressure by the pump.—Patent completed.

2138 R. Needham, Dukinfield, Chester. Feed scater keater. Dated July 4, 1868.

This consists of two chambers communicating with one another by means of a number of tubes. These chambers may be made of any suitable shape, but the patentee prefers to give them a circular form, so that the whole forms a vessel of a cylindrical shape, having a chamber at each end, and a number of tubes reaching from one to the other. These chambers are provided with hollow trunnions, and the vessel is arranged so as to rotate and expose each portion of the surface equally to the heat. The action of the apparatus is as follows:—The water being forced in, passes through the trunnions into the chamber, and thence along the pipes in a number of separate streams to the other chamber, being heated in its passage; it then passes through the other trunnions and pipes into the boilers. The vessel may be arranged so as to rotate either horizontally or vertically.—Patent abandened.

2139 T. G. MESSENGER. Loughborough. Horticultural

The vessel may be arranged so as to rotate either horizontally or vertically.—Patent abandened.

2139 T. G. MESSENGER. Loughborough. Horticultural buildings. Dated July 4, 1868.

This invention consists in part in the construction and arrangement of a number of glazed lights of equal or unequal widths fixed on one or more sides of a conservatory or other building used for horticultural or other similar purposes, such lights being hung in such manner that the whole or any number of them, on the same side, may be opened at one and the same time any required distance. The machinery or apparatus employed consists of screws and toothed wheels and worms, or their equivalent, for the purpose of opening and closing the lights before mentioned. The wheels or worms employed, or their equivalent, by acting upon a screw and travelling nut, move a rod to which are fixed arms to move the lights, and the worm and toothed wheel are fixed upon a rod to which is attached a groove wheel, in the groove of which runs an endless band or chain worked by a second wheel, and a handle fixed in any convenient part of the building to be ventilated, or the motion may be given by a rod or countershaft, to which is attached a worm and handle to act upon the worms and upon the wheels and screws and arms, or other equivalent before mentioned, for moving the light or lights required to be opened or closed; or motion may be given equivatent cetore menuoned, for moving the light or lights required to be opened or closed; or motion may be given direct, by means of a handle fixed in the place of the grooved wheel before mentioned, or otherwise, according to the requirements of the situation.—Patent completed.

to the requirements of the situation.—Patent completed.
2140 A. M. CLARK, Chancery-lane. Boot fasteners. (A communication). Dated July 4, 1868.
This consists in the employment of hooked studs to enable a boot or other article to be fastened much more readily than by other means, and further possess great strength. The hooks are disposed along each side of the opening in the boot, bag, or other article to which they are applied.—Patent completed.

2141 G. SLATER, Lamb's-passage, London. Folding cloth.

2141 G. SLATER, Lamb's-passage, London. Folding cloth. Dated July 4, 1868.

The patentee employs smooth or plain cylindrical pressing rollers, or a single plain roller arranged in combination with a vibrating or reciprocating folding bar or plate, the rollers being heated by gas or otherwise. A folding bar is caused to vibrate over the surface of the roller or table, by means of a crank or eccentric geared in connection with the roller, and at each vibration it forms a plait or fold, which is instantly carried forward and compressed between the rollers. The machine may be provided with a driving pulley, and driven by a steam engine, or may be operated by hand or other power.—Patent abandoned.

operated by hand or other power.—Patent abandoned.

2142 J. KILNER, F. H. ODLEE, and E. BUENS, Manchester

Cork drawer. Dated July 6, 1868.

This consists of a peculiarly shaped instrument, with an
angular or bent point, which is passed between the cork
and the neck of the bottle, so as to bring the angular or
bent point of the instrument below the cork, when by
turning the instrument half a revolution, the angular or
bent point is placed across the cork, and by withdrawing
the instrument, the angular or bent point brings the cork
along with it.—Patent abandoned.

2143 P. LENSEN BRIVEON. Seeing machines. (A commun-

se a piston or rod geared to the clockwork, and made by its action to rise and fall at fixed intervals. The upper part of the piston or sliding rod is bent at right angles, so as to project above the card ring. On the bent part of the sliding rod a small metallic point is fixed vertically, the point being fitted with a spiral spring. Fixed on the front frame plate, and at the back of the sliding rod, is a small horizontal elastic cushion situated a little below the ring of the compass card when suspended. A little below the ring of the compass card when suspended. A little below the ring of the compass card when suspended. A little below the plate with a suitable coloured liquid, and a little above the plate a metallic support at the further end of the elastic cushion, the ribbon being supported a little above the surface of the said cushion. The apparatus is suspended on gimbals, to allow for the motion of the ship.—Patent completed.

1336 A. M'NIEL and W. Wielator, Exeter. Sails of ammonia. Dated July 4, 1868.

The patent abandoned.

1367 A. M'NIEL and W. Wielator, Exeter. Sails of ammonia. Dated July 4, 1868.

The patent abandoned. A little below the ring of the compasses of the said cushion. The apparatus is suspended on gimbals, to allow for the motion of the ship.—Patent completed.

1368 A. M'NIEL and W. Wielator, Exeter. Sails of ammonia. Dated July 4, 1868.

The patent abandoned.

1369 A. M'NIEL and the other end being fixed to a metallic support as the torial patent of the said cushion. The apparatus is suspended on gimbals, to allow for the motion of the ship.—Patent completed.

1370 A. M'NIEL and W. Wielator, Exeter. Sails of ammonia the proportion of, say, 100lb. or 200lb. to 100 gallons of gas liquor, and they allow the grpsum to remain in the liquor for two or three weeks. The sulphate of ammonia thus formed will be found dissolved in the water, which, some part of the spot hook. The support patent of the spot hook. The support patent of the spot hook, by which means a better struck and the dry su



ing the spring or the tension at each time. The stitch regulator consists in a lever, the fulcrum of which is fixed on the clothplate. The clothplate has a graduated index on it, one end being made to press the feed-bar more or less away from the feed eccentric, which gives lateral motion, and regulates the length of the stitch—Patent completed.

completed.

2144 A. FRYER, Manchester. Concentrating sugar. Dated July 6, 1868.

These improvements refer in part to improvements in the apparatus described in the specification of letters patent, dated February 14, 1865 (No. 418). The curved blades are placed as close togother as can be done without interfering with the flow of the liquor or other solution over their surfaces, so as to divide the air, thus bringing every portion of it into more intimate contact with the solution to be evaporated or concentrated, and thereby more perfectly exhausting the whole of the heat contained in the air. The curved blades are placed at from five eighths to one-eighth of an inch apart, according to the nature and degree of saturation of the solution to be acted upon.—Patent completed.

2145 G. DAVIES, Lincoln's-inn. Locomotive engines. (A

acted upon.—Patent completed.

2145 G. DAVIES, Lincoln's-inn. Locomotive engines. (A communication). Dated July 6, 1868.

This consists in the direct application of locomotives of one or more rotary engines, giving motion to one or more pairs of horizontal wheels, which, pressing against the vertical faces of a central rail, enable the train to travel over the heaviest gradients. The machinery may be composed of a rotary steam engine, two shafts, and two horizontal wheels, and the frame screws and springs to produce any required amount of pressure on the central rail. The apparatus can be placed either on the locomotive or on its tender.—Patent completed.

produce any required amount of pressure on the central rail. The apparatus can be placed either on the locomotive or on its tender.—Patent completed.

2146 E. H. WALDENSTROM, Salford. Ricet machinery. Dated July 6, 1868.

This invention relates to the machinery employed in the manufacture of rivets, small bolts, screw blanks, and articles of a similar description, wherein the rivets or other articles are formed from a coil or a continuous length of wire, or from rods of metal, the improved arrangement of mechanism being as follows:—The metallic rod or the coil of wire from which the articles are to be formed, is supplied to the machine, either heated or not, as may be advisable, and is fed into the machine by a pair of gripping jaws which have an intermittent to-and-fro motion derived from the main slide or the slide carrying the main die, a second pair of jaws being employed to hold the rod during the backward motion of the jaws first named. The feeding jaws are fitted to a carriage mounted in slides, and is moved to-and-fro at intervals by a bar connected to the main slide, and the upper jaw is hinged to one end of a lever, the other end of the lever being acted upon by a bowl stud or projection carried by the bar when the jaws are required to grip the rod. The holding jaws consist of one fixed and one movable jaw, which is pressed towards the fixed jaw by a spring or other appliance, in order to hold the rod, and is moved therefrem to allow the rod to be fed to the cutting dies by means of a lever acted upon by the back stroke of the die and slide a regulated length of the rod is fed into a tube or ferrule in the heading and shearing block, and a sliding motion at right angles to the rod being imparted to the block, a length of wire sufficient to form a rivet is severed from the rod, the block and the surface against which it slides being fitted with shearing dies or plates. This movement brings the severed blanks opposite to the aperture the blank is thrust or injector which enters the februle in the sheari

Patent completed.

2147 J. H. Whitehead. Numnahs or saddle pads and blankets. Dated July 6, 1868.

Wool or other fibre is felted on to a coarse fabric of woven horse hair. The wool employed is coarse yellow or grey wool, or noils from the combing of long wool. An endices apron carries the ball accumulated on it into a roller hardener. As it passes into the hardener there is laid on the surface of the accumulated ball a strong openwork fabric; the whole passes together through the hardener, and the fibres of the ball become locked through the meshes of the fabric. Thus the ball and the fabric become sufficiently combined to be fulled together. The fulling operation is conducted in the usual manner, and the felting of the ball completed, the openwork fabric at the same time becomes so firmly held that it cannot be separated.—Patent completed.

2148 G. DANIES. Lincoln's Inn. Dyeing. (A communi-

at the same time becomes so irmly held that it cannot be separated.—Patent completed.

2148 G. Davies, Lincoln's Inn. Dyeing. (A communication). Dated July 7, 1868.

The unspun fibres are nordanted in the usual manner. Supposing that they are intended to be violet, they are mordanted by the ordinary process in iron mordant. The mordanting being effected, and the fibres having been well dunged, a sufficient quantity of water is added, containing such an amount of extract of madder as is found necessary. If the extract employed be acid, or if the water used be too pure, it is to be neutralized by adding a small quantity of chalk—for example, about one quarter to five per cent. The quantities of the extract or of the chalk cannot be precisely mentioned, because the commercial extract is of so variable a quality, in relation to its price, concentration, purity, and neutrality, that it is necessary to make a trial of each quantity obtained of this matter in order to obtain its strength and state of neutralization. The bath of dye being prepared, the mordanted and dunged fibres are introduced therein and dyed in the usual manner, and the inventors state that the dyeing is effected quicker than with the other derivations of madder, or with madder itself, and that the addition of glycerine to the madder or extract accelerates the dyeing still more. If there is no great hurry, fuel can be economized by dyeing at a less heat, but for a longer time. In practice, it is found advisable to dye in about an hour and a-half to two hours, at a boiling heat. When the dyeing in extract of madder is finished, there are several methods

of brightening the colour, og it may be washed with soap, as is usually done in dye works with madder violet or derivatives of madder. The fibres are to be submitted to the same treatment which a calico printer employs with madder violet calicoes, that is to say, soaped either with or without previous washing, and submitted or not to the action of chloride of lime (very weak and cold). Hitherto, in dyeing fibres, threads, or fabrics composed of vegetable and animal matters, it is difficult to impart to the vegetable fibres a solid and as beautiful a dye as to the animal fibres, but by dyeing the vegetable fibres in madder colours the patentee states that they, by means of spinning or weax-ng, mix these fibres with those of animal origin, and then proceed to dye the whole by the artificial colouring matters. Wools and silks are dyed thereby by reason of their natural aptitude, and the vegetable (previously dyed with madder) mixed therewith will take the dye in the sauge bath and at the same time their supplement of the artificial colouring matter. The vegetable fibres will not be of so pure a tint as the animal fibres, owing to the presence of the madder colours but, nevertheless, the mixture of the fibres will produce a good effect, and threads or fabrics thus produced will have the great advantage of possessing a colour and solidity hitherto unknown. In this case, for violet, it is necessary to use iron mordant, and for red or rose colour a mordant of alumina, and in the latter case, to give the supplementary dyeing in "fuchsine," or "geranocine," "coralline," or other artificial red colouring matter.—Patent completed.

2149 J. Thouson, Peckham. Chimney tops. Dated geranocine," "corall.

2149 J. Thomson, Peckham. Chimney tops.
uly 7, 1888.
This relates to chimney tops.

July 7, 1888.

This relates to chimney tops which prevent all down draught. For this purpose the upper end of the chimney top is closed, and a number of apertures formed in the sidea.—Patent shandoned.

drught. For this purpose the upper end of the chimney top is closed, and a number of apertures formed in the sides.—Patent abandoned.

2150 G. R. WILSON, Birmingham. Stereotype plates. Dated July 7, 1863.

This consists chiefly in the novel modes or processes employed to produce the impressions nor upon the indiarubber or other material. The impressions are produced either upon the shiehed vulcanized sheets or in the soft compound of which such sheets are formed, the curing or vulcanizing being in the latter case afterwards effected by the usual means. The rubber or other material and the matrix are clamped together and subjected to heat. After cooling, the vulcanized plate is removed from the matrix and is ready for use. According to one method of practising this invention, the patentee takes a sheet of hard prepared rubber, vulcanized guita-percha, or a sheet of the two substances combined, and soften the same by placing upon it a heated metal plate. The matrix or mould from which the stereotype is formed is then placed upon the softened rubber or other substance. Behind the matrix another plate of iron or other metal is placed. These two plates, with the rudder and matrix between them, are clamped or bound together, and allowed to remain so till they are cold. By this means an exact and perfect copy of the matrix is obtained upon the surface of the vulcanized plate. The metal plates may then be unfastened and the stereotype removed from the matrix is taken in the soft prepared rubber or guita-percha compound before it is vulcanized, the vulcanization being effected while in contact with the matrix, instead of using the sheets of flished "vulcanite." This soft compound is by means of calender rolls or other pressing mechanism spread in sheets or plates of the desired thickness, and is then placed upon the matrix. The rubber or other material and matrix together are then secured between two metal plates and placed in a heater or vulcanizer and heated. They are then subjected from two to three hours to a temper

wo metal piates and placed in a heater or vulcanizer and heated. They are then subjected from two to three hours to a temperature of about 300deg. or 350deg. Fah.—Patent completed.

2151 T.J. MAYALL, Roxburg, U.S.A. India-rubber soles. Dated July 7, 1868.

This consists chiefly in the novel means for preserving the surface of the sheets till they are used, and in the peculiar method of roughening the sheets on the surface which is to form the outside of the soles. The surface of the vulcanized sheet which is to form the inside of the soles is temporarily covered with some woven fabric, which is removed when the sheets are used. The other surface of the sheet, which is to form the outside or bottom of the sole, is roughened by producing upon it a pattern or impression, such impression being taken from a sheet of some woven fabric or other substance of suitable texture. In practising this invention, a sheet of cotton, cloth, or other suitable woven fabric is taken, and a layer of dissolved pure india-rubber or compound which is to form the vulcanized sheet is spread. The compund consists of india-rubber, whiting, sulphur, lithat, e., or white lead, calcined magnesia, lamp black, and clay, in the following proportions:—Four pounds of the rubber, two pounds of whiting, one pound of sulphur, one pound of litharge, one-half pound of lamp black, and two pounds of clay. This compound is applied by means of an ordinary coating machine. When the compound has been spread to the desired thickness, the sheets are passed between the covered rolls of the machine, the surface of the rubber being first sprinkled with French chalk to prevent its adhesion to the rolls. The fabric and compound are squeezed or pressed together as they pass through the rolls, and the pattern or figure of the fabric is thereby impressed upon the surface of the india-rubber compound. The sheet of the material is then wound upon a receiving roller, and is left on the same till it has been cured or vulcanized of the material is then wound upon a receivi

2152 E. COPPEE, Hain-street, Pierre, Belgium. Cols wraces. Dated July 7, 1868. This consists in the construction of coke ovens, thereby the heat given off by the coking fuel may be

utilized, the gases of combustion generated in one oven being used to light the fire in or heat the adjoining oven throughout the series. The ovens are long, deep, narrow chambers, open at top for charging, and surrounded at the side and bottom with flues. These ovens are built up side by side upon a hollow bed of brickwork, within which (at one end of the ovens and at right angles thereto) run two large flues set side by side, and both communicating with a common chimney. In one of these flues is placed a cylindrical boiler, at one end this boiler takes a vertical direction, the flue being continued upwards to receive it. The ovens are grouped in couples to allow the gases of combustion of every two ovens to commingle and pass away together. Each oven is connected at its upper part (just below the crown) by means of lateral openings, with a side flue; and at bottom, the side flues of the two adjacent ovens connect by lateral openings at the bottom of, say, the first oven. The gases here commingle and then pass under the first oven. When they arrive at the end of this flue, they enter by a lateral opening the flue under the second opening, and passing along that flue, they escape into one or other of the large flues through openings commanded by dampers, which will turn the gases either into the flue containing the boiler, or in the other which leads directly to the chimney. In covered spaces formed between what may be termed the hoppers of the ovens, are pipes for discharging the gases from the burning coal into the atmosphere and other pipes for admitting air to the ovens. This air is heated in its passage through the pipes, and it is admitted into the ovens in small jets.—

—Patent completed.

2153 F. Vetth. Zurich. Straps or bands. (A communication). Dated July 7, 1868.

2153 F. Veith. Zurich. Straps or bands. (A communication). Dated July 7, 1868.

The object of this invention is the preservation of straps or bands, and to cause them to adhere better to the arms or pulleys, and consists in coating them with a mixture of train or other such oil.—Patent abandoned.

The object of this invention is the preservation of straps or bands, and to cause them to adhere better to the arms or pulleys, and consists in coating them with a mixture of train or other such oil.—Patent abandoned.

2154 J. LAWSON and E. G. FITTON. Hackling, &c. Dated July 7, 1868.

The first improvement refers to backling machines, and consists in running the sheets over three shafts, to cause them to run lighter. It is usual to run the sheets of hackling machines over a shaft at the bottom, having drums on, varying from 8in. to 12in. diameter, and over a shaft at the top as small as convenient, say, 2in. to 2jin. diameter, in which case the sheet bears heavily on the top shaft. To lessen the friction or strain on this top shaft, a third shaft is introduced, with a pulley or a drum on, to reduce the friction or bite of the sheet, and cause the machines to run easier. The second improvement also refers to hackling machines, and consists in applying a stripping motion to the sheets or hackles. A compound motion consisting of a crank or secentric and rocking shaft, through which the shank or stem of the connecting rod passes. To the end of this shank is attached the stripper, which has a backward and forward as well as an up and down motion to strip the hackles. The third improvement relates to combing machines, and consists in using one or more rotary nippers, mounted on discs or plates, in combination with an ordinary head of spiral or screw gills and fallers. The rotary nippers are arranged to open and close like a pair of tongs or pincers, and are placed on shafts or axes. The shafts are supported in grooves or slots in plates or discs, and are free to move in eccentric grooves or neams. The disc revolves on a shaft with cams tixed on it; these cams cause the nippers to open at the proper time, as they revolve round them, holding and relieving the tufts of tow or other material as desired. As the rotary nippers are hold of fallers to rake a taft, they move forward by means of the eccentric grooves on the d

move slowly whilst taking hold of or depositing a tuft.—Patent completed.

2155 T. R. Crampton, St. George-street, Westminster. Forts, &c. Dated July 7, 1863.

In constructing forts, fortifications, or other defences, according to this invention, a mould or moulds of the form of defence required is prepared on its site, and on or near thesame one or more furnaces for melting metal is erected. The metal as melted is conveyed into the moulds as in ordinary castings. The defences can thus be cast either in one piece or they may be in blocks cast separately side by side in the position in which they are to be used. It will be seen by this process, weights can be cast which it would be impracticable to transport from a foundry, and that forts or other defences of a massive character may thus readily be constructed in any position desired. Armour plates may also be fixed in front of the forts or defences constructed as above described. In some cases, forts may be constructed of an annular form, both the inside and outside walls of the ring being corrugated. In some cases, forts may be constructed of an annular form, both the inside and outside walls of the ring being corrugated, the number of corrugations being equal to the number of guns to be employed, each corrugation having one or more holes plerced, so that the gun can take an extended rane, allowing of concentrating several guns on one point, the corrugations of the inner wall being also pierced for guns; these guns can fire over the opposite side of the fort, and enable, in some cases, some of the guns to fire from the outside and some from the inside, and be so concentrated on one object. The inner and outer walls may either be made separately, and the space between them remain uncovered, or this space may be covered over with an arched roof, either cast in one piece with the walls or otherwise. Forts may also be made of a series of cupolas of a much roof, either cast in one piece with the walls or otherwise.



may fire from any port hole; these cupolas may be isolated or placed in a circle, or other convenient arrangement, so that one or more guns on the inside and outside can be concentrated in certain cases on one point. The effect of casting in masses, on the site, insures a more homogeneous structure than can be obtained by wrought iron, since heavy wrought-iron plates cannot with any certainty be made sound, and of equal quality; besides, the difficulty of securing such immense plates together in one homogeneous mass with large bolts and nuts or rivets, is almost impracticable (in a commercial sense), besides which the great number of pleces to form a built-up fort of metal is a great element of danger.—Patent completed.

2156 B. P. Walfer, Wolschempton, Printe Angle.

is a great element of danger.—Patent completed.

2156 B. P. WALKER, Wolverhampton. Driving bands.

2156 B. P. WALKER, Wolverhampton. Driving bands.

In carrying out this invention, two clips of metal are formed, space being left between the inner surfaces of such clips sufficient to receive the ends of the belts to be joined, each clip having cut out of it the part where the band occurs for the reception of part of the end of another similar clip; the band or belt is so placed within each clip as to leave space for a pin to pass through the bends of both clips (which then form a hinge), and so fasten the two clips which unite the band firmly together. The clips are formed with holes in them to receive the pins or screws necessary to hold the bands.—Patent completed.

2.2157 A. P. Peter Lipscoling.

formed with holes in them to receive the plus or screws necessary to hold the bands.—Patent completed.

"2157 A. P. Price, Lincoln's-inn. Phosphates of lime. Dated July 7, 1868.

This consists in submitting bones, coprolites, animal charcoal, or other natural or artificial phosphates, to the action of acids, such as sulphuric, hydrochloric, or nitric acids, and precipitating from the soluble portion of the result of such decomposition what is known as bibasic phosphate of lime, or of other calcareous compounds.—Patent abandoned.

2158 G Morron, Birmingham. Ornamenting fireplaces. Dated July 7, 1868.

In ornamenting the arched or curved parts of firegrates, the patentee makes the edge of the arched parts of a beading or moulding, by preference, of a nearly new semicylindrical figure, and coat or cover the beading with a strip of perforated metal is attached to the beading. The strip of perforated metal is attached to the beading. The beading may either be left plain and unpolished, or it may be polished or painted, before the application of the strip of perforated metal. The perforations in the strip of brass or other metal may be of any desired ornamental pattern. The appearance of the plain polished or coloured beading through the perforations in the metal produces a highly ornamental effect.—Patent completed.

2159 T.J. MAYALL, Boxburg, U.S.A. India-rubber tubing.

2159 T. J. MAYALL, Boxburg, U.S.A. India-rubber tubing

ornamental effect.—Patent completed.

2159 T. J. Mayall, Boxburg, U.S.A. India-rubber tubing. Dated July 8, 1868.

This consists, chiefly, in the novel combination of ingredients forming the varnish or coating, and also in a novel compound or combination of substances for forming such tubes and other articles. The coating or lining for the interior surface of the tubes or other article is composed of linseed oil and fine litharge or white lead in the proportion of one quart of oil to one pound of litharge. The substances are well boiled together, until brought to the proper thickness of body, and while hot the composition is applied, by running it through the tube to be coated or lined. To form the varnish for the outside of the tubes or other articles, the patentee mixes one quart of linseed oil with one half pound of litharge, and adds to the same about a gill of gold size. These ingredients are well boiled together, and while hot are applied to the tube with a sponge or brush. When the tube is properly varnished, it should be hung up to dry in a room or chamber suitably heated for the purpose. The improved varnish may be applied to any kind of India-rubber tubing, or of a compound consisting of india-rubber, zinc, pipeclay, gum shellac, white resin, and sulphur. The ingredients are mixed in the proportion of 4th. of india-rubber to 2lb of sulphur. This compound should be subjected for about two hours to a temperature of 260deg. Fah, more or less. The proportions of the ingredients in this compound, and in the other compounds herein described, may be varied if desired, within certain limits. Any desired colouring matter may be mixed with the varnish for coating the exterior of the tubes or other articles, which may thus have imparted to them a highly ornamental or finished appearance.—Patent completed.

2160 T.J. Mayall, Roxburg, U.S.A. Telegraph cables.

exterior of the tubes or other articles, which may thus have imparted to them a highly ornamental or ilinished appearance.—Patent completed.

2160 T. J. Mayalla, Roxburg, U.S.A. Telegraph cables. Dated July 8, 1868.

This consists chiefly, first, in the method of encasing the conducting wires of the cables with insulating compounds and materials; second, in the application to such cables of an exterior casing of vulcanized india-rubber, gutta-percha, or a combination of both substances; and, third, in a novel compound or combination of india-rubber and gutta-percha, with other ingredients, to form the exterior casing. The conducting wires of the cable may be coated in the usual manner with india-rubber or gutta-percha, or both substances combined, or compounds of the same, with other materials, and this coating may be covered, or what is technically termed frictioned, with a solution of the same substance or compound. In this condition the cable will serve for all ordinary purposes as a land telegraph cable, but for use under some circumstances it may require additional protection, which is secured by the application of the improved protective covering over the cloth wrapper, which is prepared in the following manner.—Upon a sheet of cotton or other fabric a layer of pure rubber is spread dissolved with camphine or other solvent. Over this rubber the vulcanizing substance or compound is applied, which is then cured or vulcanized in the ordinary manner. The following compound the patentee has found suitable:—Ib. of Para rubber, Ib. of gutta-percha, Ib. of zinc, 2lb. of pipeclay, ½lb. of sulphur, ½lb. of shellac, ½lb. of French chalk, and 202. of white resin. This compound should be cured or vulcanized for about 23 hours, at a temperature of about 25 dodgs, Fahrenheit; but these proportions, as well as the number of hours and degrees of heat, may be slightly varied without affecting the result. The cloth or fabric is then removed from the vulcanizing sheet, its removal being easily effected by wetting the same wi overlapping ends are thoroughly secured and made water-

tight. When the cable is to be used for a submarine or ocean telegraph, it will be necessary to strengthen the same by the use of wire rope, or platted or twisted fibrous materials, or other substance ordinarily employed in the construction of such cables. Over this wire or other strengthening material the protective covering, as above described, is applied.—Patent completed.

described, is applied.—Patent completed.

2161 C. D. Abell. Chancery-lane. Ornamenting fabrics, dc. (A communication). Dated July 8, 1868.

This consists in the application of a metallic ornamentation upon one or both sides of open or close woven fabrics. By a composition consisting by preference of white lead or zinc white, or other suitable mineral salt, diluted with linseed and fatty oils, and copal or other similar varnish mixed together in suitable proportions for producing a fluid paste. When the ornamentation is to be applied to feathers, artificial flowers, and such like articles, the use of the white lead or zinc white may be omitted in the adhesive composition.—Patent abandoned.

white may be omitted in the adnesive composition.—Patent abandoned.

2162 J. Livchak, Vienna. Aeronautical apparatus. Dated Julys, 1868.

To the balloon which the patentee describes he gives a longitudinal shape and conic ends, and so to connect it with or secure it to the apparatus by means of a net or other texture as to keep it continually in a horizontal position, and at a suitable distance from the frame or body of the apparatus, and it is preferred to enclose it in or cover it over with an air-tight cloth or light tissue, the two edges of which may be firmly secured to a loose frame connected with the central frame or body of the apparatus. The patentee constructs the frame or body of the apparatus in such a manner as to admit into its central part a steam engine or other motor being connected with and actuating a threefold set or system of cranks or cranked levers, which in their turn are joined to or connected with a series of two, four, or more casings of prismatic or any other suitable shape, being by preference that of a trilateral prism.—Patent abandoned.

2163 J. F. Cooke, Cannon-street. Copying ink. Dated July 8, 1888.

The patentee employs as a substitute for giveerine, in

2163 J. F. COOKE, Cannon-street. Copying ink. Dated July 8, 1868.

The patentee employs as a substitute for glycerine, in the manufacture of copying ink, sugar, treacle, or chloride of calcium in solution, in the same proportions as the glycerine.—Patent abandoned.

the manufacture of copying ink, sugar, treace, or culoring of calcium in solution, in the same proportions as the glycerine.—Patent abandoned.

2184 J. Holt and G. T. Coponet, Clerkenwell. Printing machines. Dated July 8, 1868.

This invention is specially applicable to that class of machines. Dated July 8, 1868.

This invention is specially applicable to that class of machines known as "Main's," and by means of a combination of mechanism the machines are caused to print alternate sheets, and "double roll" the "forme." The impression cylinder and feed-board are maintained inoperative at pleasure, for the purpose of inking up or otherwise. The parts of Main's machine which are brought directly into contact consist of the cams for actuating the impression cylinder and feed-board, which cams are fixed on the cylinder and made to surround a portion of the driving shaft of the machine, one end of which cylinder is formed to gear with a clutch; a clutch satisfy mounted on the driving shaft capable of gearing with the end of the cylinder; a spring, by means of which the clutch can be maintained in gear with the end of the said cylinder; a sliding bar, suitably guided and placed underneath and parallel with the said driving shaft; a suitable projecting arm, on the upper side of which bar a pair of friction rollers are attached to engage a cam formed with lateral projections; the cam as it revolves imparts a to-and-fro motion to the bar. This cam forms the principal part of the combination; it'ls fixed on one extremity of a shaft, placed underneath and parallel with the sliding bar and driving shaft. On the opposite side of this shaft a toothed wheel is fixed which gears into another toothed wheel of half the diameter mounted loose on the outer extremity of the driving shaft; this latter wheel is formed to gear on one side with a clutch which is placed beside it on the driving shaft, movable, as is the first-named clutch, on feathers or fixed keys in the shaft. This clutch is actuated by means of a handle or lever so as

it at pleasure.—Patent completed.

2165 J. PREST. W. MATHER, and W. DOHERTY. Chaff cutters. Dated July 8, 1868.

This consists in the novel employment and use of two peg wheels, of different sizes, screwed to and capable of sliding on to the bottom feed roller spindle, the large one to gear in at the side of the worm (as in the present machines) and the smaller one to gear under the worm. The said peg wheels are arranged on the shaft in such a manner that either may be brought in to or out of gear with the driving worm, which may be actuated by hand or by hand and pulley. The peg wheel usually placed on the top roller spindle is dispensed with.—Patent completed.

2166 W. BROOKES. Chancery, lane. Economical A.

pleted.

2166 W. Brookes, Chancery-lane. Ecaporating. (A communication). Dated July 8, 1868.

Steam, hot water, or it may be air or gas, is conducted by a passage into the annular chamber, thence into another chamber which may be called the desiceator, from which it passes into the annular chamber, and thonce to what may be called the vaporizer, from which it passes into an annular space, from which it may pass back or away by a passage.—Patent abandoned.

2167 A. J. L. B. R. J. C. Parie. Belta bands. Acc. Dated.

away by a passage.—Patent abandoned.

2167 A. J. LE BLANC, Paris. Belts, bands, &c. Dated July 8, 1863.

This consists in the manufacture of belts, bands, or ropes by means of a fabric, by preference of cotton coated with caoutchouc, and rolled on and in to one another; it is then submitted to strong pressure, in order to cause the caoutchouc to pass through and in to the pores of the fabric; the material is subsequently coated with caoutchouc and vulcanized. The invention further consists in the employment for the manufacture of belts, bands, or ropes of all kinds of woven tissues or textile fibres, woven or twisted and impreparated with caoutchouc, gutta-percha. or other gummy or resinous materials, thus giving similar advantageous results that the present india-rubber and vulcanized cotton fabric possess; they can be made of caoutchouc, prepared to resist fatty bodies with oil.—Patent completed.

2168 E. COPPER, Belgium, Crushing and washing coal.

2168 E. COPPEE, Belgium. Crushing and washing coal. Dated July 8, 1868.

The apparatus consists of two crushing mills interposed, between which are two washing vessels connected at bottom with pumps for forcing waterup, into, and through the pulverized coal. Beyond the second mill is a trans-

verse trough or gutter, along which the crushed and washed coal is carried to chambers where it is finally deposited. The following is the mode of operating with this apparatus.—The coal is fed in at the foot of the chain of buckets, by which it is raised to the upper part, where it is poured into a hopper which conducts it to a pair of fluted rollers forming the first crushing mill. By this mill the coal will be reduced to small pieces, which, falling into an incline, will be discharged into the first washing vessel, where the operation of separating from it the heterogeneous matters which it contains will commence. The crushed coal, as it leaves the crushing mill, will be received upon an inclined grating with which the crushing vessel is fitted. Along this grating the coal will pass, approaching near to a beater wheel, at each jerk or pulsation it receives from the water, which is forced into the vessel at each stroke of the pump. If it should be required to employed the coal in an unwashed state, but which is nevertheless required to be ground, the mill is provided with two pairs of rollers, the one pair for coarsely breaking up, and the other pair for completing the crushing. The inclined plane under the mill is so set that the ground coal may fall into a shoot placed under the mill, and be conducted to the trucks provided to receive it. receive it.

receive it.

21:0 T. Kerr, Paisley. Firearms. Dated July 8, 1868
This consists in providing a hollow socket which projects rearwards from the breech end of the barrel; the rearmost end of the socket is made completely circular, whilst the intermediate part is cut away, leaving a semi-circular cavity. Through the circular extremity a sliding breech-piece passes, which can be forced by the hand close against the end of the barrel, and withdrawn therefrom with great rapidity. Towards the rearmost end of the sliding breech piece an encircling collar is fitted, this having a handle or lever formed on it so that in turning the collar by applying the hand to the handle or lever, that part of the handle or lever, as well as a projection on the opposite side of the collar, enter inclined slots cut in the circular part of the socket, so that by depressing the handle or lever firmly therein the breech-piece is forced against the breech end of the barrel.—Patent abandoned.

2170 W. TASKER, Andover. Elevating straw, &c. Dated

handle or lever firmly therein the breech-piece is forced against the breech end of the barrel.—Patent abandoned. 2170 W. TASKER, Andover. Elevating straw, &c. Dated July 8, 1868.

The machinery is so constructed that it may either take the straw direct from a thrashing machine, being worked therefrom or combined with the front or back carriage of the straw elevator without the necessity of raising or lowering the whole machine for either mode of working. The framing to which the elevator is attached, and also the framing of the elevator itself, is constructed of angle or other shaped metal bars, which may be riveted together. This framing is mounted on a front and back carriage. The invention consists chiefly in attaching to or forming on the front or back carriage of the elevator gear work or gearing, to be worked by horses or other animals passing round or under such elevator, giving motion to the same, the entrance to the trough or spout being always sufficiently low to receive the straw from a thrashing machine, if desired. The gearing may be actuated with the front or back carriage of the elevator. By this means the inconvenience (when used as a ricker in hay time and harvest) of employing a separate gear work is avoided, whilst at the same time the necessity of vertical adjustment of the whole machine is dispensed with.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT.

Dated January 12, 1868.

86 C. M'Dougall and C. H. Eden, Manchester. A ladies' umbrella and dress suspender.

87 W. E. Gedge, Wellington-street, Strand. An improvement in power looms. (A communication.)

88 A. Henry, Edinburgh. Improvements in firearms and ammunition.

89 A. P. Price, Lincoln's Inn-fields. Improvements in the production of colours from napthaline. (A communication.)

the production of colours from napthaline. (A communication.)

90 B. Hunt, Serle-street, Lincoln's Inn. Improvements in water meters. (A communication).

91 Sir F. Sykes, Isenhurst, Sussex. An improved mode of, and apparatus for, defending ships, forts, and other vessels or structures against injury from projectiles.

92 A. V. Newton, Chaneery-lane. Improvements in knitting machinery. (A communication).

93 D. L. Coates and Q. Dunlop, Belfast, and W. Orr, Ligoniel, Antrim. Improvements in couplings and wheels for shafting and gearing.

94 C. E. Brooman, Fleet-street, City, patent agent. Improvements in the construction of velocipedes. (A communication).

95 G. 1V. Osborne and A. J. Peerless, Rahere-street, Goswell-road, Middlesex. An improved ball valve or cock.

Dated January 13, 1868.

96 H. [Aitken, Falkirk, Stirling. Improvements in lamps.
97 S. Jellymann, Cannock, Staffordshire. Improvements

97 S. Jellymann, Cannock, Staffordshire. Improvements in reaping and mowing machines.
98 C. J. Gunther, Mark-lane, City. Improvements in salting and preserving meat. (A communication).
99 P. M. Barnett, Aberdeen. Improvements in fixing and securing wooden keys in railway chairs.
100 J. Steel, Glasgow. Improvements in sanitary arrangements to be substituted for water-closets.
101 L. Sterne, Great Queen-street, Westminster, and J. A. Jaques and J. A. Fanshawe, Tottenham, Middlesex. Improvements in the manufacture of clastic rubbers.
102 J. Parker, Lifford-road, Camberwell, Surrey. Further improvements in motive-power apparatus applicable for propelling vessels and for preventing vessels from foundering, and for forcing water, and for other purposes.

purposes.
103 L. Handart, King-street, Clerkenwell, Middlesex. A 103 L. Handart, King-street, Clerkenwell, Middlesex, A new tool or mould for moulding or casting dises, or wheels requiring to have letters, characters, numerals, or other devices or designs formed around or about their circumferences in metal or other materials.

104 J. Schlosser, Finsbury-place, Middlesex. A new or improved self-acting metallic packing for parts of sterm, air, zas, water, or other machinery or apparatus in which packing is required.

105 W. R. Lake, Southampton-buildings, Chancery-



lane. An improved method of, and devices for unlting the ends of pipes or tubes. (A communication).

106 C. P. Coles, Mountfield, Bonchurch, Isle of Wight. Improved means of protecting the bottoms of ships or other submerged structures from fouling.

Dated January 14, 1869.

107 G. D. Kittoe and P. Brotherhood, Compton-street, Clerkenwell Midelesex. Improvements in valves.

108 W. M'Donnell, Limerick. Improvements in, or addition to churns, parts of which are applicable to other Nurroses.

purposes.

109 R. Watson, Birmingham, and B. Dangerfield, West Bromwich, Staffordshire. Certain improvements in keysless and stop work employed in chronographs and other similar timekeepers for the measurement of fractional portions of time.

110 J. R. Hodgson, Limehouse, Middlesex. Improvements in life buoys, boats, or floating apparatus to be employed for rescuing persons in case of shipwreck or disaster at sea.

111 T. Mortlock, Singleton-street, Hoxton, Middlesex. Improvements in appearance.

disaster at sea.

111 T. Mortlock, Singleton-street, Hoxton, Middlesex.
Improvements in apparatus for levelling, furrowing, and dressing millstones.

112 E. P. North, Birmingham. Improvements in pocket

dressing millstones.

112 E. P. North, Birmingham. Improvements in pocket railway reading lamps.

113 H. Vavasseur, Summer-street Southwark, Surrey, and C. M. Wade, Furnival's Inn, Middlesex. Improvements in the permanent way of railways, which improvements are also applicable for works where wedges are used. (A communication).

114 A. V. Newton, Chancery-lane. Improvements in resping and mowing machinery. (A communication).

115 W. E. Newton, Chancery-lane. An improved stop motion and regulator for steam pumps. (A communication).

116 J. H. Kitson and J. Kirby, Leeds. Improvements in movable grates for steam boller or other furnaces.

117 T. Cook, Old Kent-road, Surrey, and J. Watson, Victoria Chambers, Westminster. Improvements in presses for expressing olls and other liquids.

118 A. M. Clark, Chancery-lane. Improvements in preced-loading firearms and cartridges. (A communication).

tion).

119 T. Birkett, Birmingham, and H. Scott, West Bromwich, Staffordshire. Improvements in breech-loading

Dated January 15, 1868.

120 H. L. Harris, Somerset-street, Aldgate, City. Improvements in the construction of [packing cases and boxes.]

120 H. L. Harris, Somerset-street, Aligate, City. Improvements in the construction of spacking cases and boxes.

121 C. H. Lea, Staffordshire. Improvements in apparatus for opening, closing, and locking rallway level crossing or other gates, which apparatus acts simultaneously on near or distant railway signals, and partly controls the working of the crossing signals, also improved apparatus for independently actuating a semaphore signal for signals) placed at the crossing, and partly controlling the working of the opening and closing apparatus; also improved apparatus used in connection with the above for locking the gates when closed, and improved means for raising or lowering such gates when necessary.

122 J. Steel, Glasgow. Improvements in apparatus for washing or cleansing casks, vats, or similar vessels.

123 A. de P. Chance, Birmingham. Improvements in step-ladders. (A communication).

124 J. T. Smith, Barrow-in-Furness, Lancashire. Improvements in converting vessels used in the manufacture of iron and steel.

125 H. Fowkes, Manchester. An improved rod to be employed for cleaning rifled or smooth-bore gun barrels, in the rollers and furniture for window blinds.

127 W. Tijou, Great George-street, Westminster, and W. Whieldon, Westminster Bridge-road, Lambeth, Surrey. Improvements in apparatus for facilitating the getting of coal, stone, and other minerals.

129 W. H. Brookes, Sheffield. An improved fastener for doors and windows. (A communication).

130 P. Spence, Newton Heath, Manchester. Improvements in the production of sulphate of potash for the manufacture of alum.

131 T. Howcroft and A. M'Gregor, Bedford Leigh, Lancashire. Improvements in reaping and mowing ma-

Improvements in reaping and mowing ma-

chines.
132 E. Craddock, Camberwell New-road, Surrey. An improved portable punch for punching metals.
133 M. Boyce. Abchurch-lane, City. Improvements in apparatus for scoring at whist and other games.
134 A. H. A. Durant, Avenue-road, Shepherd's Bush, Middlesex. Improvements in the manufacture of oil from castor and other oleaginous seeds or berries.

Dated January 16, 1869.

135 T. A. Warrington, Carlton-road, Kentish Town, Middlesex. Certain improvements in the construction of

Middlesex. Certain improvements in the construction of spoons.

136 J. T. Bintley, Kendal, Westmoreland. Improvements in the mode of, and apparatus for connecting or joining together the ends of rails in constructing the permanent way of railways.

137 S. Russell Burton-road, Brixton, Surrey. Improvements in velocipedes and manumetive carriages.

138 R. Craig, Newbattle Mills, near Dalkeith, Midlothian, Scotland. Improvements in machinery or apparatus for the manufacture of paper.

139 J. Jeavons and W. Waplington, Atlas Steel and Iron Works, Sheffield. Improvements in the manufacture of iron and steel, and in the apparatus connected therewith.

of iron and steel, and in the apparatus connected therewith.

140 J. G. Johnson, Coombe Fields, Warwickshire. Improvements in self-acting signalling apparatus applicable for use on railways or tramways, and for other purposes.

141 J. H. Johnson, Lincoln's Inn-delds. Improvements in the manufacture of casks, tubs, and other like receptacles, and in the machinery or apparatus employed therein. (A communication).

142 H. A. Silver, Bishopsgate Within, City. Improvements in apparatus for cooking and other purposes.

143 J. Bourne, Leith, Scotland. Improvements in propelling versels.

144 J. Loader and W. H. Child, Finsbury, Middlesex. Improvements in ateam boilers.

145 W. and S. Bottomley, Milnrow-road, Rochdale, Lancashire. Improvements in the couplings of rollers for cotton, silk, woollen, worsted, and other machinery.

146 W. Thomas, Cheepside, City. Improvements in the manufacture of boots and shoes.

147 J. B. Whitehall, Goldsmith-street, Nottingham. Improvements in machinery and apparatus for the manufacture of looped fabrics.

148 F. Braby, Camberwell, Surrey. Improvements in the commercial manufacture of sulphate of ammonia.

149 L. B. Phillips, Queen-square, Middlesex. Improvements in means for obtaining in metals or alloys facsimiles of works of art, and designs in relief and intaglio, composed of metals, wood, gems, wax, and other substances, and also of type and parts of machinery.

150 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in the manufacture of figured shawls and other woven fabrics. (A communication).

151 M. Henry, Fleet-street, City. Improvements in moulding metal articles. (A communication).

Dated January 18, 1869.

152 W. Pidding, Walcot-square, Surrey. Improvements in the mode or modes of the production or manufacture of cat piled mosaic, mosaic textile and tesselated fabrics, in the treatment of materials used, and in machinery and apparatus used for the said purpose.

apparatus used for the said purpose.

153 W. H. Platt, Ashton-under-Lyne, Lancashire. Improvements in looms for weaving.

154 N. Voice, Handcross, Sussex. Improvements in apparatus connected with closets and urinals.

155 C. Catlow, Burnley, Lancashire. Improvements in looms for weaving.

156 J. D. Thomas, Liverpool. An improved artificial

bust.

157 P. Oldfield, Bradford, Yorkshire. Improvements in machinery for preparing and combing wool or other brous substances.

153 R. H. Clark, Eavsham, Norfolk. Improvements in the manufacture of silk cloths, and in fixing them on silk bolting reels for dressing meal and flour.

159 G. R. Postlethwaite, Birmingham. Improvements in machinery for the manufacture of screw puts belts.

bolting reels for dressing meat and flour.

159 G. R. Postlethwaite, Birmingham. Improvements in machinery for the manufacture of screw nuts, bolts, spikes, rivets, screw blanks, and other like articles.

160 J. W. Price, Frogmore-street, Abergavenny, Monmouthshire. Improvements in the manufacture of horse shoe naits and other nails, and in machinery to be employed therein.

161 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in propelling machinery for canal boats and other vessels, parts of which improvements are applicable to the propulsion of vehicles on land. (A communication).

162 G. Brown, Beaumont-place, Edinburgh. Improvements in gas meters and other measures by apparatus for registering the passage of gas and other bodies.

163 J. H. Johnson, Lincoln's Inn-leids. Improvements in the burning of bricks and other like articles, and in the kilns employed therein. (A communication).

164 A. M. Clark, Chancery-lane. Improvements in the manufacture and rething of sugar. (A communication).

the manufacture and relining of sugar. (A communication).

165 H. and J. Parnall, Bristol. Improvements in the construction of centres and bearings of scales, scale beams, and weighing machines.

166 W. T. Eley, Gray's Inn-road, Middlesex. Improvements in the construction of cartridge cases.

PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the following numbers :-

2800 3047 3602 3628 8646 3650 3652 3654 3696 3726 8749	3760 3790 3797 3835 3905 3915 3932 3947 3949 3951 3953	3955 3957 3959 3963 3966 3967 3968 3969 3970 3971 3972	3973 3974 3975 3977 3979 3980 3981 3982 3983 3984 3985	3986 3987 3988 3989 3990 3991 1 2 8 4	6 7 8 9 10 11 12 13 14 15	16 17 18 20 21 22 25 26 27 30	31 33 35 36 38 40 41 42 43 44	
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## NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," January 19, 1869.

From the "London Gazette," January 19, 1869.
2749 H. M. Lee. Cases for containing address cards.
2753 W. T. Carrington. Capstans.
2764 A. J. Fraser. Locks.
2774 J. Millward. Steam boilers. (A communication).
2788 J. Maynes. Solf-acting mechanism for supplying seft without stoppage to looms.
2792 J. Challender and B. Kitchen. Mechanical apparatus for placing and securing fog signals upon the metals of railways.
2802 J. Bullough. Warping machines.

ratus for placing and securing fog signals upon the metals of railways.

2802 J. Bullough. Warping machines.

2802 E. T. Hughes. Annealing gauze wire. (A communication).

2806 J. Roberts. Portable stove.

2813 F. Warner. Constructing wells, and in pumps to be used therewith.

2814 E. Turner. Packing for pistous.

2817 J. Coppard. Machines for mincing meat.

2821 C. E. Pommier. Sizeling paper.

2822 M. A. Soul. Spring pendulums for chronometers.

(A communication).
2823 J. D. Pinfold. Machinery for grinding grain.
2831 M. Benson. Steam pumping engines. (A com-

2831 M. Benson. Steam pumping engines. (a. 2832 E. Sarjeant. Gasellers. 2835 F. Braily. Sweeping machines. 2835 F. Braily. Sweeping machines. 2853 J. de Masy. Cases for holding railway tickets. 2855 G. B. Sharpe. Firegrates. 2857 W. Betts. Apparatus for capsuling bottles. 2852 W. T. Watts. Annealing raised hollow vessels. 2871 R. Smith. Means for preventing the fouling of fron ships bottoms. 2881 W. Needham and J. Kits. Machinery for depurating fluids.

2881 W. Needham and J. Kite. Machinery for deputating fluids.
2897 G. Sanders. Safety valves. (A communication).
2902 C. Wheeler. Apparatus for turning on and cutting off the supply of liquids.
2924 A. Barclay. Barometers.
2952 P. J. E. Caron. Safety apparatus for chains or

of hoisting gear.

J. H. Johnson. Permanent way of railways. (A communication).

2974 T. Briggs. Connecting the ends of metal bands for curing bales. 2988 G. Daws. Machinery for opening cart gates and

turn-tiles.

2994 J. H. Johnson. Manufacture of white lead. (A communication).

3024 R. F. Drury, J. E. and W. G. Walker. Ratchet and

3024 H. F. Ding, ...
Frank braces,
3137 W. Yates. Furnaces,
3246 C. B. James. Needle-cases,
3276 T. Speight and W. H. France. Wool-combing
machines,
3565 C. D. Abel. Converting cast fron into wrought
iven. (A communication).

3565 C. D. Abel. Converting cast from into wrought iron. (A communication).
3613 D. Greig and J. Fernle. Casting plough heads.
3726 A. Krupp. Breech-loading ordnance.
3971 G. Davies. Separating ores. (A communication).
16 J. G. Tongue. Sewing together the separate parts of a volume. (A communication).
23 H. A. Bonneville. Process for coating articles with gold. (A communication).

gold. (A communication). The full titles of the patents in the above list can be

scertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

### LIST OF SEALED PATENTS.

	Sealed Janua	ry 15, 1869.
2265 J. Thomas 2266 W. Berry 2270 H. B. Barlow 2279 R. Brett and G. Daniels	Shackleton 2243 W. R. Lake 2244 W. R. Lake 2248 E. Funnell 2257 S. Deacon 2263 C. G. Johnson 2265 J. Thomas 2266 W. Berry 2270 H. B. Barlow 2279 R. Brett and G.	2299 W. T. Hamilton 2301 W. T. Hamilton 2303 S. H. Hadley 2372 J. Simpson 2420 J. E. Outridge 2427 G. Wilson 2434 G. T. Bousfield 2735 S. Sharrock 2918 G. Ritchie

Sealed Janu	ary 19, 1869.
2271 T. W. Gray 2272 W. Winter 2273 W. J. Cunningham 2278 C. P. Wilcox 2278 I. Rose 2284 C. Weekes 2287 T. Deschamps 2293 T. Gibb 2204 G. Martin 2306 T. F., J., C. H., and E. Firth 2308 F. H. Hambleton 2318 M. T. Shaw and T. H. Head 2322 J. S. Bromhead and J. Whitmel 2332 W. E. Gedge 2334 J. H. Johnson	2393 J. Dugnid   2453 A. V. Newton   2456 H. Churchman   2471 B. Hunt   2497 A. V. Newton   2506 J. H. Johnson   2506 G. A. Buchholz   2528 W. E. Newton   2536 H. Steffanson and J.   Hadley   2849 F. F. Greenwood   2872 W. Clissold   3007 G. T. Bousfield   3255 E. Wimbridge   3278 W. Mort   3311 S. Ault   3396 W. Manwaring   3475 H. A. Bonneville
2353 C. J. Laurendeau	3483 J. Haro

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HAS BEE	EN PAID.
108 J. M. Napier	172 W. Sumner
138 D. F. Lecocq	186 G. T. Bousfield
140 C. H. Roeckner	202 W. Jeffries
148 R. Cherry, E. Cross-	209 G. B. Woodruff
ley, and W. Bower	210 J. Stringer and G.
155 C. J. Crondace and J.	Birch
Field	226 J. Howard and E.T.
168 G. Spencer	Bousfield
169 W. Hibbert	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

140 W. S. Mappin

#### LIST OF SPECIFICATIONS PUBLISHED. For the week ending January 16, 1869.

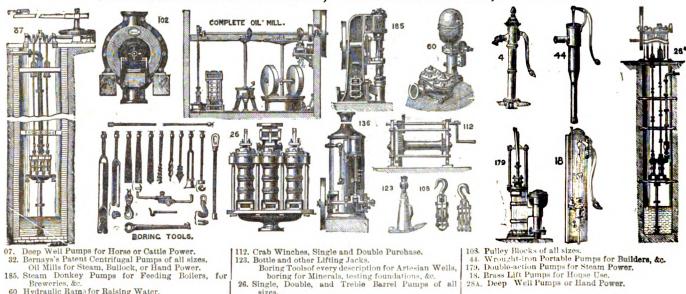
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1689	0	8	1768	0	10	1834	0	- 6	1878	0	4	1907	0	4	1926	0	4
1705	1	-6	1770	1	0	1835	0	10	1879	0	4	1908	0	4	1929	0	4
1707	0	8	1775	0	10	1842	1	2	1880	0	4	1909	0	4	1930	0	4
1712	ı	0	1777	1	0	1844	0	8	1882	0	4	1912	0	4	1932	0	4
1713	0	8	1783	0	10	1848	0	۶.	1883	0	- 8	1915	0	4	1934	0	4
1717	0	6	1793	0	8	1851	0	10	1884	0	4	1916	0	4	1939	0	4
1718	ı	0	1794	0	- 8	1853	0	٠	1885	0	4	1917	0	4	1944	0	4
1722	ı	6	1805	0	10	1859	0	£.	1986	0	10	1215	0	4	1945	0	4
1723	1	0	1808	0	6	1865	0	10	1887	0	4	1920	0	4	1946	0	4
1753	0	8	1809	0	6	1873	0	4	1891	0	4	1921	0	4	2148	0	6
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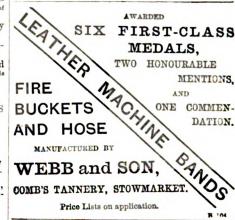
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THE

### MECHANICS' MAGAZINE.

LONDON: FRIDAY, JANUARY 29, 1869.

SEWERAGE OF GLASGOW.

T the time that the metropolitan drainage A works were undertaken it was felt by some that the proposed plan of discharging the whole sewage of London into the Thames was not that which should have been adopted. In the incipient state of the sewage question at that period, although one cannot commend the system carried out, yet it may be fairly excused. But no such excuse can be pleaded now for those who advocate the execution of methods so suicidal. The true and only principle upon which sewage can be disposed of, with a proper regard to sanitary considerations, existing habits, and opinions, and with a chance of producing a remunerative return, is that of application to the soil. It will scarcely be believed that, notwithstanding the universal recognition by not only every engineer, but by every man of common sense, of the truth of this self-evident proposition, it is proposed to repeat the "wilful waste" upon a large scale in the waters of the Clyde.\* For some time past the question of utilizing their sewage has occupied the townspeople and local subhorities of the city of Clesgow and like authorities of the city of Glasgow, and, like wise men, they called in the assistance of eminent engineers to help them towards arriving at a solution of the many difficulties invariably attendant upon extensive projects of a similar nature. In accordance with in-structions received, Messrs. Bateman and Bazalgette prepared plans for the utilization of the sewage, which were founded upon the principle that we have already laid down as the only correct standard in such cases. It is not to be supposed that because plans for sewage or any other works are prepared by eminent engineers they are not liable to criticism and fair animadversion; and in the details of those to which we have referred there may very possibly be many points deserving of reconsideration. But it is one thing to suggest amendments, to modify or to extend, and another to attack the principle or basis upon which a project is founded.

Engineers continually differ in the means

they adopt for carrying out works, but no competent professional men ever differ about the principle upon which those works are based. The former constitutes each man's individuality, and serves to bring out his own especial genius and ability, while the latter demonstrates the unity of competent professional opinion. Notwithstanding the incontrovertible veracity of this statement. that it is seriously proposed by the writer to discharge the sewage, "after a short and rapid run, directly into the river." Such a course is not only contemplated, but the means of accomplishing it are entered fully into, and the prospective advantages of measures so suicidal and opposed to all plain sense, are attempted to be proved. Although our duty is simply to point out the professional errors—both theoretical and practical into which the author falls, yet we cannot refrain from commenting upon the somewhat egotistical manner in which he claims for "his plan," which is opposed to the opinions held by avery professional manual held by every professional man, every advantage under the sun, while at the same time he denies to that of Messrs. Bateman and Bazalgette the possession of any merit whatever. One of the main errors into

• See "Sewage Irrigation: being a Second Letter addressed to the Hon. the Lord Provost," By MICHAEL SCOTT, C.E., London.

which Mr. Scott falls is the supposition that the advocates of sewage irrigation argue "a particulari ad universale," and that they consider the successful application of sewage upon a comparatively small scale is a guarantee for its success upon one more extensive. We do consider that the utilization of sewage will be successful upon a large scale, and, in fact, that it will never be thoroughly successful until it is applied upon an extensive scale, but not because it has hitherto proved so when tried in a limited sphere. We consider the success of the utilization of sewage to depend not upon the scale of its application, but upon the sound and unimpeachable truth of the principle upon which it is based. It is well to be able to distinguish between simple cause and effect and conclusions deduced from analogical reasoning.

In reading the report of the commission appointed to inquire into the best mode of distributing the sewage of towns and applying it to beneficial and profitable use, we are forcibly reminded of that issued over twenty years ago to inquire into the application of iron to railway structures. The same uncertainty and want of foresight prevails in both. The Sewage Commissioners report that sewage is "quite inappropriate for application on a comprehensive scale to arable land for corn and other ordinary rotation crops." This statement is simply so much nonsense, and the fallacy of it has been already demonstrated with a degree of certainty sufficient to convince all but those who are wilfully blind to the fact. Similarly, the Railway Commission of 1848 reported respect-ing the use of open-web bridges that "they were of doubtful merit," and in plain terms expressed their fears of the safety of bridges constructed upon that system. Now, we have a couple of railway bridges over the Thames presenting magnificent specimens of that type of design, besides innumerable examples in all parts of the country. So much for the reports of Commissions. In treating the Clyde as a sewer, it is expected, by the influx of a large quantity of fresh or sea water, to neutralize the noxious and injurious action that must be necessarily set up. is an utter fallacy, and will be found so in every case. It is true that there is a peculiarly purifying influence exerted by large volumes of uncontaminated water and air upon sewage, but the remedy is only partial—never

complete. After the results that have attended the discharge of the London sewage at Crossness, the transporting and purifying action of tidal waters is a subject that now admits of but one answer. A grave disadvantage of relying upon these agents to effect the deodorization and removal of town sewage is that their inefficacy is in a continually increasing ratio with the duration of their action. Were it granted that during the first year they would effect the desired object, they would be found to fail more and more each succeeding season. It is impossible to totally remove by these means all vestiges of the sewage matter. Some will inevitably remain, and constitute a nucleus around which more will accumulate, until the once clean and uncontaminated banks will become like even unto the shores of the Thames at Erith and Greenhithe. There can be no question that the plan of Messrs. Bateman and Bazalgette for the utilization of the sewage of Glasgow is admirably adapted for its purpose. It is based upon the only correct method of dealing with sewage, which consists in removing it rapidly and effectually from the vicinity of human habitations, ceasing to discharge it into rivers, thereby converting them into gigantic sewers, and applying it instead to the fertilization of the soil. To discharge any sewage into a river, as proposed by the author of the letter referred

prudence. It does not signify what is to be subsequently done with it, whether it be purified in reality, or only in imagination, as in the case before us; the very act of dis-charging a single drop of sewage, diluted or undiluted, into a river should be sufficient to hopelessly condemn any plan containing that feature in its composition. To pour sewage into a river and then to attempt to neutralize it by purifying agents is exactly similar to presenting a person with a poisoned draught, and then administering an ineffectual antidote.

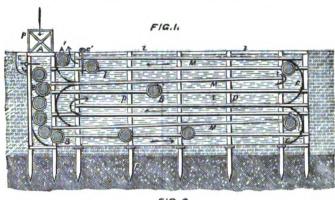
#### PRESERVATION OF IRON SHIPS.

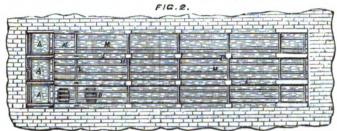
NUMBERLESS as have been the plans devised for preserving the vised for preserving the bottoms of iron-built ships, and for preventing their fouling, the list still continues to increase. Amongst the most recent and successful attempts in this direction is that of Captain Cowper P. Coles, R.N., C.B., to which we briefly alluded last week. Captain Coles has been for some time past engaged on a series of experiments in Portsmouth Dockyard, with the view of solving the problem in question. About a week since, an iron-built mortar vessel, which has lately been doing duty as a movable coal depôt, was placed in the "Warrior" dock at Portsmouth, and her bottom carefully examined. On the bottom of this vessel, for several years past, different kinds of compositions for the preservation of the bottoms of iron ships and for the prevention of their fouling, have been tested and periodically reported upon by the Shipwright Department of the dockyard for the information of the Admiralty. On the bottom of this vessel are two patches of cement composition applied on the plan proposed by Captain Coles, one of which was put on four, and the other three years since. The efficiency of these preservative cements has been satisfactorily proved by having portions of them cut away from the vessel's bottom with a chisel, when the iron plates underneath were found in perfect preservation, and as free from outer deterioration of any kind as on the day the cement was first laid over them. The anti-fouling experiment has been equally successful. In November, 1867, the last occasion on which the vessel was in dock, a patch of the cement was laid on the bottom plating under the bilge, and, before drying, was coated with a copper facing in the form of dust or filings. This patch now, after the vessel has been quite fourteen months in the water, is found to be quite clean and free from any deposit whatever, fully answering all the require-ments that would be expected from a sheet of copper fixed in any similar position. results, therefore, so far, are highly satisfactory, and if they continue to be so, and are accompanied by corresponding commercial advantages, another honour will attach to the gallant captain's name.

But Captain Coles is not the only one to whom credit is due for his exertions in prevent ing fouling and corrosion, inasmuch as within the last few days the results of some trials of another invention for the same purpose have reached us. The inventor, in this case, is an artizan—Mr. William Welch, of Portsmouth -who by patient perseverance, natural intelli-gence, and careful observation during three or four years, has invented and applied a composition which combines all the necessary qualities, being self-adhesive, preservative, and anti-fouling. With the sanction of the Lords of the Admiralty, it has been tried on several of her Majesty's ships, and notably on the bottom of the "Urgent" troop ship. After nearly two years' trial of the composi-tion on that ship, it was found to be as clean as the first day it was put on, although, in the meantime, the "Urgent" had been in all parts of the world. It has since been tried on other vessels, and recently on the "Her-cules." We understand the mercantile to, is a proceeding that should be scouted as cules." We understand the mercantile a direct violation of all laws of economy and marine are about to adopt it, and that the

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#### STORING PETROLEUM.





Peninsular and Oriental Company have ordered a test application of it to one of their vessels. The composition has been patented by Mr. Welch. There can be no doubt that on the proved success of either of these in-ventions there hangs a large fortune. At present, it appears to be a fair race between Captain Coles and Mr. Welch, and may the best man win.

#### STORING PETROLEUM.

O such a pitch has the danger of storing and transporting mineral oils and essences of an inflammatory character reached, that many of the means originally available for conveying them from one place to another are now closed against them. It is not without reason that these precautionary measures have been adopted, as the numerous fatal catastrophes that have occurred in magazines, and storehouses, railway trains, and steam-boats, abundantly testify. So far as the material itself is concerned, the loss, commercially speaking, of a large quantity, is not a trifle, to mention nothing of the enormous consequential damages that attend the explosion and combustion of so inflammable a substance. The probability, or, rather, the risk of the contents of any cask, barrel, or other receptacle, in which mineral oils may be placed, being fired, and so communicating the mischief to other objects is very materially increased by the leakage or evaporation that is continually taking place, and which seems, hitherto, to be a feature inseparable from the present means in practice for preserving it.
Wooden casks still remain the favourite receptacles for petroleum and other mineral There are many and valid reasons for their being so. Among others, are their shape and strength, which is due to their peculiar form, their comparatively small price, relatively large capacity, and facility for manipulation and stowage. In spite, therefore, of many attempts made to introduce iron vessels of different shapes and sizes, the old material, timber, is not yet dispossessed of its sphere of utility in this particular instance.

Upon the arrival of a vessel laden with a cargo of this dangerous character, there are no other places to store it in than the usual cellars or sheds that are appropriated as well to a host of other miscellaneous articles. The defective nature of such an arrangement is visible at a glance. Another plan of empty-ing the contents of the casks into a single large reservoir, is one that were it once accom-

plished would leave nothing to be desired. It is in the task of accomplishing it that the danger lies. The successive handling and knocking about of the barrels under operation, is perilous in the extreme, and one that could scarcely be regarded justifiable anywhere in the vicinity of a large town or city. It has also been proposed to bury the casks in the ground, but it would be difficult to exercise a sufficient surveillance over them when in this situation. The principle upon which the greatest reliance may be placed, is that of immersing the casks containing the petroleum in water. Under these circumstances, it is impossible for the contents to take fire, and, it is also alleged, that the water causes the wood to expand, and, by completely closing the seams, prevents all leakage. of this plan is unquestionably sound, and will receive the assent of everyone, but no such unanimity of opinion will prevail respecting the best practical methods of accomplish-ing the operation. There is not merely the manipulation, the storage, and the general arrangement of the cask to be taken into consideration, but, in addition, the difficulty of keeping the casks under the surface of the the casks under the surface of the protecting fluid when they are once placed there. This last is of more importance than may at first sight seem probable. The upward pressure upon an ordinary cask of petroleum, totally immersed in water, is 100lb. and that upon a similarly shaped receptacle, containing essential oil, amounts to nearly 125lb. Calculating from these data, a row of six barrels, ranged about two to every square yard, would require a downward pressure of over 1,350lb. to keep them in their place. Consequently, the obstacles to be surmounted consequently, the obstacles to be sufmointed consist, first, of the actual immersing of the casks; second, of their maintenance in their position; and, third, of their adjustment in a manner that would allow of all, or any of

them, being withdrawn with facility.

The plan proposed by M. Mathéi is to make the upward pressure of the water subservient towards effecting the object in view, and the plan and longitudinal section repreand the plan and longitudinal section represented in the accompanying cuts will serve to illustrate the mode he adopts. In a reservoir, the size of which will depend upon the number of casks proposed to be stored, two rows of piles, p, are driven deep enough into the ground to get a firm hold, and tied together by transoms, so as to counteract the vertical force already alluded to. These piles are arranged so that the cask B can be moved in any direction that may be required, and tory annual examination, made when at rest, also to admit of openings into the reservoir internally as well as in the flues. To accom-

or magazine at A. To the piles, the spacing or magazine at A. To the piles, the spacing of which is regulated by the resistance to be overcome, are attached, by means of timber or metal crosspieces, long planks M (see fig. 2), forming a series of consecutive and superimposed inclined planes. According to the size of the casks, and the density of the liquid contained in them, so must the degree of inclination of these planes be arranged. Longitudinal timbers, L, prevent the barrels from deviating laterally during their passage up the inclines. The barrels pass from one incline to the next, by means of the semicircular passages C C (see fig. 1). There is a sliding bar C, at the entrance A, to prevent the barrels rising up again after immersion; and the opening for their egress A' is furnished with a similar apparatus. On referring to fig. 1, it will be seen that the barrels are immersed one on top of the other, until the well or pit A is filled, and the cask first immersed has reached the bottom. Arrived here, being still acted upon by the upward pressure of the water, it travels along the inclined planes, M, until it reaches the opening for egress at A', where it is retained under the surface of the water by the apparatus C 1. Since the size of the passages are so adjusted that the casks cannot pass one another in their ascent, they range them-selves in regular order, until, either as many are stored as are required, or until the magazine is completely filled. It has yet to be shown how the pressure necessary to cause the casks to sink to the bottom of the pit A is obtained. The doors P of the entrance pit A are so constructed to open upwards, and, in fact, to constitute a prolongation of the entrance itself. In this space a number of casks are piled, of a weight sufficient to sink the others consecutively. When the magazine is filled, the bar C is run across When the the opening, to keep the casks from rising; the supernumerary casks are withdrawn, and the doors closed. From the extreme simplicity of the whole operation, this plan is deserving of trial, in all cases where, from unavoidable circumstances, it becomes indispensable to store up large quantities of petroleum and essential oils. In point of cost and first outlay, this method appears capable of competing with any other that has been proposed with the object of accomplishing the same result.

#### BOILER INSPECTION.

WE have this week received the closing W report, for the past year, of Mr. Fletcher, the chief engineer to the Manchester Boiler Association. Having always been warm advocates of boiler inspection, we cannot let the present opportunity pass of recording a few facts and impressions derivable from the report in question. The first fact realized after a perusal of the document is one of the most important and significant of any. It is that no explosion has occurred to any of the boilers under the charge of the any of the bollers under the charge of the above Association during the year, while to this it may be added, that no boiler has ever exploded which the Association has guaranteed. This fact says much for the soundness of independent boiler inspection, and we see no reason why the same return may not be made every year, if the insured parties will only co-operate with the officers of the Association by accepting the suggestions for their safety, as well as by affording facili-ties for the examination of their boilers, and above all by intrusting them to the charge o f ordinarily competent men, instead of to mere labourers, as is but too often proved to be the

The Association does all it can to further e interests of humanity. It adopts the the interests of humanity. It adopts the principle of the most liberal inspection, and no boiler is guaranteed unless on a satisfac-

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plish this with so many boilers, and, at the same time, to make the examinations when the boilers can be best laid off, so as not to inconvenience the members, appears to be by no means an easy matter, and has only been accomplished by making the utmost use of general holidays, as well as of local wakes, and other times of stoppage. We are sure it would be a matter of very great advantage to both parties if those members who cannot lay off their builers at the ordinary periodical visits for entire examinations, would avail themselves of their own local holidays, rather than of the general ones, when there is a complete run upon the office for special visits. To meet these demands at all, it has been found necessary at such times to lay aside all the other duties of the Association, and for the whole staff to turn out as inspectors. In this way, the number of entire examinations for the past month, returned at the commencement of the report, viz., 204, were accomplished, a considerable portion to them being made at the Christmas holidays. The total number of entire examinations during the past year has been 2,060, which, we understand, is the highest point ever attained since the formation of the Association. This result has been attained at a considerable cost, but it has been thought better to expend the funds of the Association rather on careful examinations than in the payment of compensation, upon the principle, we presume, that prevention is better than cure. Competent inspection, however, is found by experience to be a most expensive article-much more so than compensation; so that it would be to the advantage of the Association's exchequer to reduce its staff of inspectors, and carry a portion of the balance to the credit of the compensation fund. But far more praiseworthy motives are at the bottom of the proceedings; the fundamental principle of the Association is the prevention of explosions and the saving of human life, and so it merges its own interests in those of the community at

large.
We have already observed that no explosion has occurred during the past year to any boiler enrolled with the Association. On the other hand, 45 have occurred outside its ranks in different parts of the country, by which 117 persons have been injured, 57 of them fatally. In 32 cases the scene of the catastrophe was visited, and a careful investigation made by officers of the Association. have more than once drawn attention to the verdicts given by coroners' juries in respect of accidents of this nature, and there can be no doubt that in many cases during the past year the investigations conducted by coroners, in consequence of boiler explosions, have been most unsatisfactory. But little light has been thrown on the true cause of the disasters, and the stereotyped verdict of "Accidental death" has been given in almost every case, which has at least failed to stimulate any preventive measures, if it has not actually hindered them. Deaths from boiler explosions may be accidental legally, but they are not so mechanically. The inveterate habit still prevails of attributing almost every explosion to shortness of water, through the neglect of the attendants, though too frequently the poor fellows have been victimized by working bad boilers, the offspring of bungling boiler making, and commercial greed. Mr. Fletcher insists upon the importance of coroners being empowered in all cases to call in competent engineering assistance. A searching examination should be made in each instance, as well as the truth plainly spoken. Finally, Mr. Fletcher very justly observes:-- Were the press provided in this way with faithful particulars, and those who lead to the slaughter of their work-people, by the use of bad boilers, brought to the bar of public opinion, it is thought such a step would of itself do much toward the a step would of itself do much toward the prevention of steam boiler explosions, which now recur on an average at the rate of one the dark room. He says that in summer the "The Best Light for Taking Photographs,"

per week, and destroy from 60 to 70 lives per annum. The experience of the past year suggests as a corrective for boiler explosions, investigation and exposure."

#### IMPROVEMENTS IN PHOTOGRAPHY. No. II.

NEXT in order, the almanack of the "Photographic Name" tographic News," containing the cream of the results obtained by the best of its contributors for the past year, demands our atten-tion. Mr. H. P. Robinson, in an article upon development and intensification, points out, as a hitherto unnoticed fact, that if the developer be allowed to remain quietly upon the exposed film, the resulting picture will be less hard, and contain more detail in the shadows, than if the developer be kept in constant motion. The knowledge of this little fact, should it be properly substantiated, is of considerable value to photographers, because it affects the character of every picture taken by the wet process. A good endeavour is made by the editor of the journal to account for the phenomenon theoretically. He suggests that when the developer is motionless upon the plate, the high lights, after receiving a strong deposit of silver, have a layer of proportionately weakened developer above them, and the stronger part of the developer is left more immediately in contact with the shadows which require bringing out. If, on the contrary, the developer be kept in constant motion, so as to be of the same strength throughout its whole bulk, the silver is thrown down in a much larger proportion upon the places where the light has acted most, and the shadows are therefore brought up to less intensity. We think, from observation, that it is the habit of nearly all photographers to keep the developer in constant motion upon the plate, but the valuable fact just stated, should it be substantiated, will certainly modify future developing operations very considerably. It places a power in the hands of the photographer of increasing the hardness or softness of his picture, according to the motion he chooses to give to the plate during development.

Mr. Jabez Hughes calls attention to a simple method, devised by Mr. Phillips, of keeping wet plates in a fit condition for use for many hours. It consists simply of placing them in a bath of distilled water till wanted, after taking them out of the nitrate of silver. After exposure and before development, the plate must be redipped in the nitrate of silver bath; a dip of two or three seconds is not enough, but from thirty to sixty seconds will do. Mr. Hughes asserts that there is no loss of sensitiveness whatever in the plate from this treatment, and that there is great immunity from stains and defects. The only point requiring care is to select good distilled water, as bad water would make the plates fog. Of course, this plan is only useful where long exposures in the camera are necessary, or where the plate has to be carried to a long distance from the operating room before insertion in the camera. Impure distilled water is also a source of a very great number of failures in the dry processes, as Mr. William England points out in a contribution on this subject. This experimentalist has found impure water to produce insensitive dry plates, giving hard pictures, covered with granular markings. After trying several ways of increasing the purity of common water by chemical means and by filtration, he met with nothing but failures, and finds that the only remedy is to set up a still to obtain the large quantity of pure water neces-

sary in dry-plate operations.

Mr. Valentine Blanchard, the photographer who produced the well-known instantaneous views of the streets of London, has an article

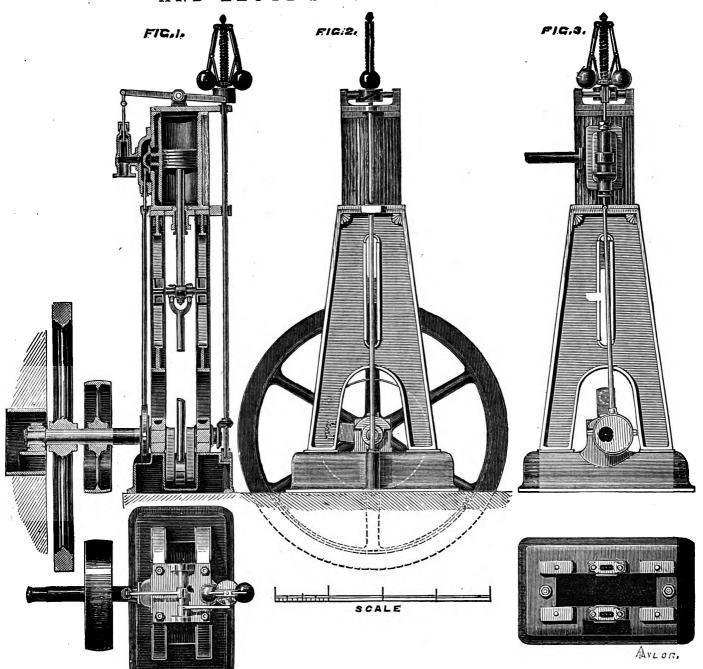
chief cause of dirty plates is perspiration from the hands, and all photographers should be very careful in hot weather to have plenty of plates cleaned early in the morning to last all through the day. When this is not done, and plates have to be hurriedly cleaned in a hot room, many failures will result from the want of a chemically clean surface. He says that it rarely happens that a film splits away from the glass from any fault in the collodion, but most commonly from dampness of the glass before coating. Another great cause, which he does not notice, of the slipping away of pictures from the glass, is the dipping of the plate in the bath too soon after it is covered with the collodion. He says that with "the bromo-iodised collodions now in the market, it is better to have the bath nearer 40 than 30 grains to the ounce. A very weak bath tends to give fog, and even when working mode-rately well, there is a strong tendency to violent contrast. On the other hand, however, with a 40-grain neutral bath, and with a developer of 30 grains, it will be found that if there is a slight over-exposure, or much diffused light in the room, or any stray light in the dark room, or doubtful yellow glass, there will also be fog. A distinct difference in the two kinds of deposit will, however, be visible; the plate from the weak bath will have a coarse, grey, muddy deposit upon the shadows, whilst that of the other will be very white and fine . . . . It should be remembered that the strength of the iron solution materially affects the deposit of silver upon the plate, and that, when great delicacy is required, as in the rendering the details of a white dress, a solution of 10 grains of iron will be found much better than one of 20 grains. The improved result is due to the great clearness of all the shadows. A weak developer will also easier give a brilliant result than a strong one, if the negative be well exposed in a good light." He says, also, that whilst a bath of 30 grains will serve for a collodion giving a thin opal film, not less than 40 grains will do for one of a thick creamy character.

Mr. John Spiller, F.C.S., points out that photographs upon paper, which look cold and flat, in consequence of over toning, can be much improved in appearance by being painted over with a weak solution of red aniline dye. He employs solutions of acetate of rosaniline (magenta), containing one-tenth of a grain or less of the salt, dissolved in a pint of water. Mr. Russell Manners Gordon, a very successful worker in dry plates, communicates a paper upon the gum and gallic acid dry process. He says that, unlike most dry plates, they work well with iron develop-ment. The developer consists of gelatine, 1 grain; acetic acid, 15 minims; photosulphate of iron, 20 to 30 grains; water, 1oz. After wetting the plate with distilled water, previous to development, take as much of the above iron solution as is necessary to cover the surface of the film, and add to each drachm one drop of a 30-grain solution of nitrate of silver. Add the silver to the iron developer before pouring it over the film. The development is nearly as rapid as that of a wet plate. Intensification may be performed by adding a few drops more nitrate of silver to the developer, applying it, and then well washing the plate. Afterwards complete the intensification with pyrogallic acid, 2 grains; citric acid, 2 grains; water, 1oz.; and a few drops of the silver solution.

of the silver solution.

The useful little publication now under notice contains also "A Word on Art in Photography," by M. Adam Solomon; "Rapid Solar Camera Printing," by J. E. Mayall; "Intensifying Negatives by Means of Uranium," by John Anthony, M.D.; "A Bundle of Laths," by Nelson K. Cherrill; "Notes in the Sunlight," by J. Werge; "The Truth of Photography, and Retouched Nogatives." of Photography and Retouched Negatives,

### SIX-HORSE POWER VERTICAL ENGINE AT WISHART AND LLOYD'S TOBACCO WORKS.



#### MACHINERY FOR MANUFACTURING TOBACCO.

OBACCO, in one shape or other, is such a familiar object to all, that few pause to inquire into the manner in which it is converted from the raw leaf into the marketable form. If they did, they would find that it involved some very nicely-adjusted mechanical arrangements, and that in the production of ordinary cut tobaccos, the mechanical engineer plays no mean part. In mechanical engineer plays no mean part. In points about it well worth noticing. It has a one of the engine by bevel wheels at its lower order to place before our readers the mechanical cylinder 8in. diameter and 16in. stroke, end, two strokes of the cut-off valve are

by Samuel Fry. There are also contributions by J. W. Swan, Fred. R. Window, Walter Woodbury, A. de Constant, W. H. Davies, William Blair, Dr. Liesegang, J. R. Johnson, H. Baden Pritchard, William Mayland, George Wardley, Alfred Keene, Netterville Briggs, John Eastham, Peter Mawdesley, F. W. Hart, Matthew Whiting, jun., J. M. Burgess, R. Slingsby, H. Kelsall, M.D., F. G. Eliot, E. Cocking, C. E. Pearce, T. Gulliver, and P. Meagher. trade require it.

Commencing with the motive power, we will descend to the basement, where we find the engine, which forms the subject of the engraving above, and in which fig. 1 is a vertical section and a plan, fig. 2 a side elevation, and fig. 3 an end elevation and plan of the framing. This engine was conplan of the framing. This engine was constructed by Messrs. Kittoe and Brotherhood, of Compton-street, Clerkenwell, having been designed by the junior partner of that firm. It is a 6-horse power vertical engine, and drives the whole of the machinery. It has some

standing on the top of two A-shaped frames which have the guides for the cylinder crosshead cast in them. They are bolted at the bottom to a compact bed plate, having two plummer blocks cast on, carrying a wroughtplummer blocks cast on, carrying a wrought-iron crank close to the throws, an outer bear-ing being provided in a wall box. The slide valve is worked by an eccentric in the ordinarymanner, and cuts off at three-quarters of stroke. There is an automatic expansion or stroke. There is an automatic expansion worked by the governor, as shown in our engraving. A spindle passes from the bed plate to the upper part of the engine, and carries a governor, which acts upon a cylindrical block sliding on the spindle, and having a cam groove cast in it, into which the pad of a love is fitted with a steel roller. having a cam groove cast in it, into which the end of a lever is fitted with a steel roller; a shaft carried in brackets on top of cylinder communicates motion to the cut-off valve, situated at the back of the main valve box. The cut-off valve is a long piston working in a cylinder, steam-tight, and passing in its strokes an annular opening in the cylinder. The governor spindle being driven at two to one of the engine by bevel wheels at its lower and two strokes of the cut-off valve are

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given to one of the engine, and suppression takes place sooner or later, according to the position and height of the balls of the governor. This is found a very efficient expansion apparatus, and regulates the speed of the engine to a nicety, and an uniform speed of 75 revolutions of the engine is obtained under all conditions of load. The engine, therefore, works with great economy, and uses an exceedingly small quantity of

steam, giving every satisfaction. The steam, after leaving the engine, exhausts into a feed-water heater, which consists of a cast-iron cylinder, about 3ft. high and 2ft. diameter, having a cast-iron pot of somewhat smaller size inserted into it with suitable steam-tight covers, on the top of which one of Kittoe and Brotherhood's patent No. 1 Paragon pumps is fixed, which pumps the feed water into the pot, and thence it finds its way into the boiler through a nonreturn valve. The feed water thus receives a great accession of heat, and enters the boiler almost at 200deg.; and the small donkey engine works admirably with little cost, and, we were told, has given no trouble whatever since it was started. An exhaust pipe leaves the heater and enters the chimney after having done its work. To drive the engine, a 10-horse power Field boiler is used, having a descending flue which passes under the floor, thus occupying no room above its top, which is just under the ground floor, and covered with a grating to admit light and air.

On the basement also is the apparatus for grinding the knives of the tobaccocutting machine, and which consists of two of Ransomes' free grit grindstones, 4ft. 6in. diameter, and 16in. wide, running in a castiron trough, and having a lateral motion imparted to them as they revolve. The knives are fastened in a rest, and kept stationary; the edge being in contact with the stones, a perfectly uniform bevel is obtained, and the knives are ground with great precision. This apparatus was supplied by Messrs. Kittoe

and Brotherhood.

The engine drives a line of shafting in the basement, from which motion is communicated to the various machines there. From this shafting, motion is also transmitted to shafting on the ground floor by means of a belt and riggers. On this floor we found the tobacco-cutting apparatus, which was supplied by Mr. R. Legg, of Owen's-row, St. John's-street-road. This is a selffeeding machine, by which cut tobacco can be manufactured in a much more perfect, expeditious, and economical manner than by the imperfect machinery formerly in use. Previously to the introduction of Mr. Legg's machine in 1859, two separate machines were required for cutting tobacco into fine shreds, called "Shag." First, the press (either screw or hydraulic) in which the leaves were formed into hard cakes; and, second, the cutting-engine, in which the cakes of leaves were cut into shreds. The labour of filling and working the presses and of removing the cakes from the presses to the cutting engine was considerable, and some kinds of tobacco were much deteriorated by Then, the mechanical action of the process. the cutting engine was very faulty, inasmuch as, in it, the cakes of leaves were pressed in a kind of horizontal vice, and afterwards squeezed out from between the two fixed flat surfaces towards the knife, thus producing great strain and friction; besides which, a considerable portion of both ends and sides of each cake, being imperfectly cut, were thrown back as "pickings," and helped to make "smalls" in the next box or cake. Mr. Legg's machine receives the leaf

tobacco into a feeding trough or box, from which it is drawn and pressed by rollers; the which it is drawn and pressed by rollers; the lower roller, of very large diameter, is faced with wood, thus forming a cylindrical chopping block, and on it the knife descends. The upper, or compressing rollers, are smaller, and of metal; they are placed between the conditions of the premises in a very dry and brittle condition, it first undergoes a steaming in a kind of closet full of these, 1,450 were original American works, 359 trays. It is transferred thence to the liquor-ing floor, where it is properly prepared for further operations. That for cavendish and continent of Europe.

feeding box and the knife, and the bearing blocks for their ends are so fitted that they may slide up or down according to the thickness of the feed, and are held down with a yielding pressure obtained by means of weights and levers. All the rollers are made to revolve simultaneously, and with intermit-tent motion, corresponding with the up-strokes of the knife-arm, by means of ratchet wheels, which may be changed at pleasure for others with a different number of teeth, in order to produce the required degree of fineness in the cut. By this combination, all the labour and waste of pressing in a separate press is avoided. Just sufficient pressure only is given to the tobacco to make it firm enough for cutting; consequently, the shag is much brighter and more bulky, it separates more readily, requires less labour, and makes less "shorts" in dressing, and the facility with "shorts" in dressing, and the facility with which all the leaves are laid in and drawn straight forward by the rollers, ensures every cut being made in the right direction, that is, across the leaf. From an inspection of this machine, while at work, we are able to speak to the perfectness of its operation. It is one of Mr. Legg's largest size, and contains all his recent improvements. The bed plate is very massive, whilst the whole of the framework, without being cumbrous, is well adapted to resist the great strains caused by the rapid reciprocating motions of the machine. All the wearing parts have improved means of adjustment, and a great convenience is introduced in the form of wedges, actuated by screws, for gradually raising the main drum as the wood wears away.

On the same floor is placed the steaming apparatus, which consists of a perforated copper cylinder, closed at one end by a movable cover, and caused to rotate alternately in each direction by self-acting gear under the floor. The cylinder is carried on friction rollers in a steam jacket, and steam is admitted, which finds its way through perforations to the tobacco, provision being made to prevent its provision imparting moisture; and when the operation is complete, a plunger is forced forward, and ejects the tobacco on to the stove pan. This stove pan, or hot plate, is simply an open metal trough heated beneath, and is used for the purpose of drying the tobacco when it is ejected from the steaming apparatus. Adjoining this hot plate is a cooler, which is another open trough, having a perforated bottom. On this the tobacco is laid to cool after it has been removed from the hot plate. The cooling is here effected by means of an induced current of air, which is drawn downwards through the tobacco by a passage which communicates with the chimney of the boiler

On the floor over this is a steamer for opening the raw leaf, and a liquoring floor, which is laid with asphalte, and inclines from all sides to a given point, at which the super-fluous liquor flows off. The floor above is the stock room, where all the tobacco is received, and from whence it is issued to the various departments. Mounting still higher, we come to the spinning floor, where the roll tobacco is prepared. Here is a long table and a spinning-wheel, by which the leaf tobacco, properly prepared, is spun into various thicknesses of rope. The rope is then wound into balls or other marketable shapes, and is subjected to great pressure in substantial presses, one of which, of improved form, was supplied by Mr. Legg.

It will thus be seen that the raw tobacco

undergoes various manipulations before it is ready for use. The operations may be briefly summed up as follows, with reference to the machinery already described:—The leaf tobacco being received on the premises in a very dry and brittle condition, it first under-

roll tobacco is sent to the spinning room, that for cut tobacco is sent below cutting machine, which it leaves in very fine shreds, which adhere closely to each other. It is opened in the revolving steamer, dried on the hot plate, and cooled on the cooler close by, which it leaves in a fit state for the market. Messrs. Wishart and Lloyd have evidently spared neither trouble nor expense in rendering their manufactory as complete as possible. The arrangement of all the details is exceedingly satisfactory, and the machinery does credit to the two firms by which it has been supplied.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

WHITE PICKLE FOR ARTICLES OF COPPER AND BRASS -OXYGEN FROM SULPHURIC ACID-A NEW GUN-POWDER—COLOURING MATTER FROM COCKCHAFERS -REMOVAL OF PHOSPHORUS FROM IRON-COPPER

DR HILLER recommends the following as an improved means of giving a silvery lustre to articles of brass and copper. The old process, by the use of cream of tartar and powdered tin, is slow, and gives uncertain results, but the solutions here described by the doctor give very uniform effects in a very few minutes. One part of salts of tin is to be dissolved in ten parts of water, and to this solution (continually stirred) is to be added a second, made by dissolving one part of caustic potash in ten parts of water. The mixture will be cloudy at first, but will gradually become clear, and is then ready for use. Objects to be whitened i.e., tinned, have only to be immersed in the mixture, made hot, a thin plate of tin of considerable surface being immersed at the same time.

A mode of preparing oxygen, which may, under some circumstances, be cheap and convenient, is given by M.M. Clomadeuc and Moret. saturate fragments of pumice stone with sulphuric acid, and heat them in an iron retort. The vapour of sulphuric acid thus obtained is carried into or more other retorts, filled with pieces of pumice and heated to whiteness. The sulphuric acid is thus dissociated, as we say now, into sulphurous acid, which is arrested by water, while the oxygen can be passed on to a gasometer. Thus the manufacture of sulphurous acid with the sulphurous aci facture of sulphurous acid might be combined with the production of oxygen.

A new gunpowder of extraordinary power is said to have been invented by a M. Perthuiset, but we are not yet enlightened as to its composition. Shells loaded with it can be made to burst

at the moment of impact, or after penetration.

We noticed last year that a lubricating and a salad oil had been extracted from cockchafers. We now read that another chemist obtains a beautiful golden yellow colouring matter from

While the discussion on the removal of phosphorus from iron is going on, we may recal to our readers' notice the experiments of M. Caron, who found that phosphates were completely decomposed by fusion with fluoride of calcium, and that at the temperature of cast steel the phosphorus is completely volatilized.

Copper, most of our readers well know, can be procured in a very fine state of division and fit for bronzing by reducing a solution of a salt of copper by boiling it with grape sugar and a caustic alkali. The difficulty they may have found perhaps has been to separate the fine powder from the liquid, for it does not settle well and soon clogs a filter. Stolba now tells us that the filtration is quickly and easily made, if the alkaline solution be just neu-tralized with sulphuric acid. The powder of copper can then be washed with hot water, and must afterwards be quickly dried in a hot place. dry, the powder oxidizes very slowly, and when rubbed gives a brilliant bronze.



#### INSTITUTION OF CIVIL ENGINEERS.

A T a meeting of the Institution of Olvin Engineers held January 26, 1869, Mr. C. H. Gregory, president, in the chair, the paper read was on a description of the new ferry and the new Brighton T a meeting of the Institution of Civil Engineers piers and landing stages, on the river Mersey, near Liverpool, by Mr. Henry Hooper, Assoc. Inst. C.E. The ferry accommodation of the river Mersey

having been briefly noticed, it was stated that in order to provide a means of communication by water between the central and the southern por tions of Liverpool and New Ferry on the opposite shore, the Mersey River Steamboat Company was originated, to run steamers from the Prince's Stage to the south end of the borough, and thence across

to the south end of the the estuary to New Ferry.

This necessitated the erection of a pior, with connecting bridge, at New landing stage and connecting bridge, at New Ferry, which was constructed from the designs of Ferry, which was constructed from the designs of Mr. Brunlees, M. Inst. C.E., by Messrs. W. and J. Galloway and Sons, under the superintendence of the author. The pier consisted of fourteen spans, each 58ft. in the clear. It was formed of three lines of wrought-iron girders, placed 9ft apart from centre to centre, and resting on cast-iron columns. The openings were arranged in from columns. The openings were arranged in three groups,—the first, from the retaining wall towards the river, comprising five bays, then two rows of columns; next, four bays and again two rows of columns; and lastly, five bays, terminated by a platform, 18ft. by 16ft., supported on a cluster of eighteen columns and piles. The girders were each 60ft. in length, 4ft. 9in. in depth, and of the ordinary lattice form, footways of Memel planking being carried on the bottom flanges. The two footways were each 8ft. 4in. in width, and were assigned respectively to the traffic passing in opposite directions. The top member of the girder as composed of two half-round bulb irons, forming, when riveted together through the flanges, a tube of 8in. external diameter. The two outside girders were each calculated to bear a load of 120lb. per superficial foot of platform, and the centre girder was nearly twice the strength of the others. The supporting columns were 12in. external diameter, the metal being in thickness. They were generally cast in lengths of 10ft., and connected together by flange joints, excepting the junction of the columns with the piles, which was of a socket form. The piles were cast in variable lengths, to suit the contour of the ground; they were furnished with one turn of a screw at the bottom, 2ft. 6in. in diameter, the metal being 1 in. in thickness at the root, and the top of each pile was of a plain spigot form. The piles were screwed down to depths of from 6ft. to 10ft. by means of capstans.

The outer edge of the platform at the head of the pier formed a bearing for the movable joint at the upper end of the bridge connecting the pier with the floating stage. This joint allowed a horizontal and vertical motion of the bridge, and consisted of a strong wrought-iron girder, having a radial motion round a steel pin, 4in. in diameter, fixed to part of the framework on the top of the columns. The vertical motion was obtained by means of a hinge under each girder of the bridge, composed of a wrought-iron forging, bolted to a rotating girder, and a steel pin, 21 in. in diameter, passed through it, and the two forged straps riveted round the end of the bridge. The under side of the the end of the bridge. rotating girder immediately beneath these hinges was supplied with two sheaves, or rollers, bearing on segments fixed to the heads of the columns. The bridge was 158ft. in length, and was formed of two bowstring girders, on the lattice principle, 10ft. in depth at the centre, and placed 9ft. 8in These girders were kept in place at the bottom by T-irons, and at the top by an arch of wrought iron. The lower end of the bridge was suspended by chains from a wrought-iron cradle fixed on the floating stage. This was considered necessary, to reduce the strain on the pier and bridge, sary, to reduce the strain on the pier and bridge, caused by the rolling of the stage, and was found to answer very well. The platform of the pier was 12ft. above high water of ordinary spring tides, and 7ft. above an extraordinary tide of 21ft.

The floating stage was 100ft. in length by 22ft. in breadth, tapering for a length of 19ft. to 19ft. in breadth, tapering for a length of 19ft, to 19ft, at each end. A spur, 22ft, by 11ft,, projected at the back under the bridge. The pontoon was 7ft. 3in. in depth, and the sides had a batter inwards of 1ft. It was built of ribs of T-iron, and was divided into five compartments by four water-tight bulkheads. To increase its stiffness, there was a longitudinal bulkhead along the centre of the pontoon, and smaller bulkheads under the cradle supporting the bridge. The deck and appurtenances were of the usual description. The

stage was moored by four chains, two at each end of the pontoon. Each chain was fifty fathoms in length, and at right angles to the adjoining one, the end of each being secured to an anchor with Provision was made for taking in the slack of the chains by two sets of gearing, fixed on the stage, one at each end. The pontoon drew about 2ft. of water, and at low water of spring tides there was never less than from 7ft. to 8ft. of water at the front of the stage.

The dimensions of the various parts of the structure were given in detail; and with regard to the expenditure upon the works, it appeared that the approaches cost £1,063, the pier (including the bridge) £7,740, and the stage £2,674, making a total of £11,477.

The design for the new Brighton pier and landing stage was of a similar character to that of the new Ferry pier, and was likewise furnished by Mr. Brunlees, the original contractors being Messrs. Rothwell and Co., but the works were finally completed by Messrs. Bowdler and Chaffer. The pier consisted of three lines of wrought-iron girders. each 60ft. in length, the number of bays or spans being twelve, divided into three groups of four spans each, by two intermediate rows of columns. The enlarged platform at the river end of the pier was 33ft. 6in. by 16ft., and was supported by short wrought-iron girders, resting upon a cluster of twenty vertical and thirteen raking cast-iron columns, 12in. external diameter, the metal being three-quarters of an inch thick. The screw piles were 2/t. 6in. in diameter, and had a pitch of 7in. three-quarters of an inch thick. They passed through variable depths of from 5ft. to 8ft. of sand and gravel to the surface of the rock underneath. The width of the pier from centre to centre of the outside girders 4in.; the centre girder dividing the platform into two footways, each 10ft. in the clear, the girders forming the parapets. The bridge connecting the pier and stage was 160ft. in length; the two girders The bridge connecting the were 11ft. apart from centre to centre, leaving a clear footway of 10ft. 3in. The upper end of the bridge had a similar motion to, and the lower end was hung by chains from a wrought-iron cradle on the same principle as that at New Ferry.

The floating stage was 200ft. in length by 30ft. in breadth, and consisted of a series of twelve pontoons, connected by three lines of lattice girders and two lines of box keelsons. The end pontoons were pointed so as to act as cutwaters, pontoons were pointed so as to act as cutwaters, and were each 29ft. by 18ft.; the ten intermediate pontoons were 29ft. by 11ft. 6in., and the depth of all the pontoons was 6ft. 8in. The stage was finished in the usual manner, and was provided

with all necessary fittings.

The dimensions of the various parts were given in detail, and in conclusion it was stated that the total cost of the pier, bridge, stage, and subsidiary works had amounted to £23 906.

It was announced that the monthly ballot for members would be taken at the next meeting, Tuesday, February 2, when the following paper would be read—"The Mauritius Railways, Midland Line," by Mr. J. R. Mosse, M. Inst. C.E.

#### THE SOCIETY OF ARTS AND THE PATENT LAWS.

N an exhaustive paper read by Mr. Davenport before the Society of Arts, in which the author gives a history of the Society from the period of its incorporation to the year 1852, the following observations on the Patent Laws occur. They are well worthy of reproduction in our columns, as indicating what the Society of Arts has done to promote the interests of inventors in this direction. Mr. Davenport says:-

I must now travel back to the year 1849, when the Council resolved to appoint a committee to consider and promote, if possible, legislative recognition of the rights of inventors, and in November, 1850, it was announced "That a number of noblemen and gentlemen, members of the Society, have consented to act as a committee for promoting the legislative recognition of the rights of inventors, by means of an easy registration of them in accordance with the principles agreed on by the council in 1849.

These principles were:-"1. That inventors, designers, &c., ought not to be subjected to any other expenses than such as may be absolutely necessary to secure to them the protection of their inventions.

enced in connection with patents should be removed.

designs for articles of manufacture, and the protection afforded to the authors and proprietors of inventions and of designs in arts and manufactures, are inadequate.

"4. That for carrying out these objects, the co-operation of all persons interested therein be invited.

"The points on which the committee wish particularly to obtain information are:—lst, the effect which the existing system of patents may have had in suppressing and thus depriving the public of the knowledge and the use of inventions of those who are unable to bear the heavy expenses required under it. And 2nd, heavy expenses required under it. instances where the expenses have been fruitlessly incurred.

At the first meeting of the committee, held on November 19, 1850, the committee unanimously affirmed the principles on which they were constituted, and resolved to prepare at once the draft of a bill embodying them; and at the second meeting, on November 29, the following resolutions were passed :-

"1. That the present tribunals are insufficient for the trial of subjects of designs and inventions.

"2. That there should be penalties for using the title of patent or registered, where none has ever existed.

"3. That registrations of inventions shall be obtainable for a period of one year, on payment of £5; and shall be renewable for four periods, of five years each, on payment of £10 at first val; of £20 at second renewal; of £50 at third renewal; and of £100 at fourth renewal.

"4. That the surplus profits, after paying office expenses and compensation, shall be directly applied to some public purpose connected with invention, but not carried to the consolidated

The first report of the committee was ordered by the Council to be printed and published on December 2, 1850. It reviewed the position of the inventor in this country. A British subject, it stated, has no right of property whatever in the intellectual labour which produces invention or scientific discovery, excepting such as can be obtained by petition from the Crown.

The inventor in France, in America, in Holland, and in Bolgium, even in Austria and Spain, has his right recognized by declared law, but the Englishman has none.

That England presents the anomaly, that, whilst it is the greatest manufacturing nation in the world, possessing boundless capital and most active industrial energy, combined with a vast amount of inventive ability, to which the genius of the people gives the most practical development, the principles of jurisprudence which should regulate its inventive science and its manufacturing skill are very far behind those of other nations inferior in civilization to itself.

"The committee will proceed to determine those principles which it has appeared to them ought to regulate the jurisprudence of inventions.

"The peculiar circumstances under which inventors are placed will be first examined. be impossible,' as a recent treasury report states, to ascertain with certainty when grants of letters patent for the sole use of inventors were first made in this country. in this country. . . . but the Crown has always been the source of that absolute power which determines rights not otherwise defined, and always possessed the full power of granting letters patent for inventions.'

"It has appeared to the committee unnecessary to show how the exercise of the royal prerogative since the first letters patent were issued in the third year of King John, A.D. 1201, affected those rights which, by the progress of the nation, are no longer subjected to the will either of the Sovereign or of the ministry, which have become the responsible interpretors of it; but it must be noticed that whilst many rights and objects were formerly regulated by the legislature, still the Crown continued to exercise a power of granting all that class of smaller personal rights which were generally designated as monopolies. Even this power of granting monopolies became intelerable, and, in the 21st of James I., it was taken away by Parliament from the Crown. . . . In the famous Act of the 21st of James I., c. 3, the power of granting monopolies was abolished; but the power of granting letters patent for inventions was left.

"2. That the difficulties and anomalies experimed in connection with patents should be removed.

"3. That the present term of copyright in position to claim any right whatever until he has



passed through thirty-five official stages of cost and delay.

The committee then proceed to point out the difficulties by which persons holding patents were surrounded, if circumstances rendered an appeal to law necessary, in order that they might maintain their rights, as well as to the efforts which, during the past twenty years, had been made to amend all experience had proved that it ystem, but was hopeless whilst the present system of granting patents existed.

After an elaborate examination into the various views and opinions as to what constitutes an inven-tion, and the conditions under which inventions should be protected by law, the report concluded as follows:—"It would thus appear that it is simply the business of the State to provide an easy means of registration of claims which the law should regard as valid until they are proved to be otherwise, as it is the case in almost every civilized country but our own. And the establishment of any tribunal to investigate claims either before they are disputed or afterwards, appears altogether a separate and distinct question, quite independent of the policy of recognizing the rights of inventors to the fruits of their labour."

Appended to the report was a comparative view of the laws for the protection of inventions in Europe and America. On January 15, 1851, Mr. Henry Cole, the

chairman of the Council, in his address, said :-

"Already the members of the Society may be congratulated on the successful results of the labours of the influential committee of its members, which has been formed to promote the legisof inventors. lative recognition of the rights has been announced that her Majesty's Govern-ment are prepared to ask Parliament to confer the right on inventors to exhibit their inventions at the Great Exhibition, without subjecting them to the pains and penalties for so doing which are entailed by the present system of patent laws, and there can be little doubt that this right, so consistent with honesty and common sense, will be continued beyond the period of the Exhibition. The labours of the Council will not be relaxed in affording every assistance to invest invention with its due rights and position as a science

A special Act of Parliament was subsequently assed, under which inventions were allowed to be exhibited at the Great Exhibition of 1851, upon registration and open to subsequent patent; and in the second report from the committee, printed January 22, 1851, it is stated that, "in addition to the early results of their labours, the committee have received announcements of the formation of numerous committees established with similar objects of promoting complete reform of the patent These committees have been formed in the metropolis, Manchester, Belfast, Birmingam, Leeds, and other places. They have also had brought to their notice the resolution passed at a meeting of the British Association, by a committee consisting of several of its most distinguished members. Some of the views expressed by these committees are announced in the appendix to the

report."
The resolutions referred to as having been sed at the British Association were as follows:

"I. That the patent laws as they new exist are capable of great improvement.

"That the right of property in invention is entitled to as great a protection as the right of

property in literature and the fine arts.

"3. That it might be expedient to remove the heavy expense now attending the taking out of patents, and adopt a graduated scale for portions of time renewable, and increasing from a lower to a higher rate.

"4. That previous inquiry by a competent tribunal should take place before granting patents." The report of the Society's committee then pro-

The result of the deliberations of the committee has been the production of the following resolutions, which the committee venture to offer to the consideration of Her Majesty's Government, as the basis upon which it appears to them that a reform of the present system should be promoted in Parliament

"1. That everything in respect of which a patent may now be granted should be registered.

"2. That the benefits afforded by registration

should extend to the United Kingdom of Great Britain and Ireland and the Channel Islands.

43. That the registration should be considered erely as a record of claims, and not as any determination of rights between parties.

4. That it should be competent to an inventor

to make disclaimers, and to rectify errors in his specification.

"5. That registration of inventions should be obtainable for a period of one year, on payment of £5, and should be renewable for three periods of five years each, on payment of £10 at first renewal, of £20 at second renewal, of £50 at third renewal, and a fourth renewal should be obtained upon appeal, as at present, to the Privy Council. principle of renewed payments, increasing in amount, is proposed as a means of testing whether an invention is in use, and of removing useless inventive rights that might otherwise be obstructive of improvements.)

"6. That there should be penalties for using the title 'patent' or 'registration' where none has

ever existed.

7. That the present tribunals are insufficient for the trial of subjects of designs and inventions.

"8. That it should be permitted to sommence actions for infringement of the rights of inventions

in the county courts.

"9. That inasmuch as, contrary to expectation, very little litigation has been created by the rights conferred by the Designs Act of 1842 and 1843, the committee is of opinion that a fair trial should be given to the working of the proposed system of registration of inventions, before any special tribunal to determine inventive rights is substituted for existing tribunal

"10. That any tribunal before which proceed-ings are commenced, should have power to refer any case for report and certificate to the registrar,

any case for report and estimate the sur registrat, assisted by competent and estimatific persons.

"II. That upon the illegality of the registration being established by the judgment or order of a competent tribunal, the registration should be cancelled.

"12. That there should be only one of the transaction of business connected with the re-gistration of inventions and the payment of fees thereof.

"13. That every person desiring to register an invention, should submit two copies of the specification of his claim, accompanied in every case, when it is possible, by descriptive drawings.

"14. That the mode and procedure of registration should be regulated by the Board of Trade.

tion should be regulated by the Board of Trade, subject to a report to Parliament. "15. That an annual report of all specifications

registered, with proper indexes and calendars, should be laid before Parliament.

"16. That a collection of all the specifications should be made, calendared, and indexed, and deposited for public information in the British Museum.

"17. That it is highly desirable that s collection should be printed and published.

"18. That the surplus profits, after paying office expenses, should be directly applied to some public purpose connected with invention, but not carried to the consolidated fund.

"19. That the importation of any patented invention practised abreed ought not to confer a title to registration, except in the case of the proprietors and inventors, within twelve months from the date of the foreign patent, and that no invention of which the patent has expired in any foreign country, or which has been published for a period of twelve months in any foreign country, or which is in free public use in any foreign country, eaght to be capable of being registered in the United Kingdom.'

The committee in their report review the objections which have been advanced against the principle of registration and progressive fees. They say:—"The argument that the present great cost of patents, by rendering the rights few, is a benefit the manufacturers, is unsound. test does not determine the merit or legality of the invention, but simply proves that the inventor could either afford to pay the fees, or that he could induce some one else to pay them for him. In short, the very reverse of the inconvenience prophesied may be expected from cheap registra tion of invention. Make little rights respected, and a better tone of morals is fostered towards all rights, both large and small. nize the right of inventors, and invention will be elevated into a science. Those who fear such a result are those who fear the spread of education and are like those who, in the middle ages, would have burned astronomers and metallurgists as witches, and who even within the memory of the

present time denied the pretensions of geology or political economy to the rank of a science."

In December, 1851, upon the opening of the Society's Exhibition of Inventions, the provisional Phill presed by the Government is thus Registration Bill passed by the Government is thus referred to—" The Act of 1851, allowing a pro-

visional registration in the case of inventions exposed at the Great Exhibition, appeared to the Council to be a great public good, and a reform in the direction recommended in their two reports on the rights of inventors, and it was their wish, if possible, that permission should have been given to expose such inventions at the rooms of the Society after the close of the Great Exhibition, without prejudice to their future patentability; and, in other words, that the principle involved in that Act should be confirmed in other cases than the one which originally gave rise to it.

"As the Board of Trade did not see fit to accede

to this request, the present collection has been deprived of a great number of articles of interest

and scientific value.

"It is an evidence of the favour with which the public would receive a cheap patent law, such as that recommended by the Council in their two reports, that although the Act of 1851 only came into operation on April 22, the registrations made under it amount to more than a third of the whole number, otherwise registered and patented during the twelvemenths, ending October 31. Upwards of 700 persons availed themselves of the Act on this occasion, and registered and exhibited their inventions."

The third report of the committee, printed in January, 1852, referred to the attempts made dur-ing the last session of Parliament, and the prospects of the present session in improving the patent law. The Council congratulated the Society that the Act passed before the opening of the Exhibition of the Works of Industry of all Nations recognized the right of property in invention, independently of the payment of any fee, upon disclosing the nature of the invention to the public; the simple registration of the right without any preliminary judgment passed on its novelty or merits; the policy of exhibiting and publishing the invention by which the interests of science, as well as those of the public and proprietors, are rendered reciprocal

The committee state that they had under their consideration the patent bill, which was sent from the Lords to the Commons in the last session of Parliament, and take exception to the creation of a numerous commission of the high officers of state, and other matters in the bill referred to, call attention to the evidence printed in their second report, and add—"With all the experience of the past session, and after the very general discussion the subject which has taken place, the committee see no reason to modify the resolutions by which they sought to establish the fundamental principles of jurisprudence which should govern improved legislation in the recognition of patent rights, and with increased confidence again submit them to the consideration of the Legislature.

The committee prepared the heads of a bill to embody these resolutions, accompanied with an explanation of the mode in which the system was

likely to work.

Bill, embodying in the main the principles laid down by the Society's committee, was soon afterwards passed by Parliament, and it still continues to be the Patent Law of England. Under it the people of this country have obtained protection at small cost, immediate publication of the specifications, a patent library of reference, and a museum of patents for consultation. This museum is arranged in a temporary building placed on the ground, bought by the commissioners of the Exhibition of 1851.

#### INSTITUTION OF NAVAL ARCHITECTS.

WE have to inform our readers that the tenth annual meeting of the Institution of Naval Architects will take place on Thursday, Friday, and Saturday, the 18th, 19th, and 20th of March next, at the Hall of the Society of Arta, John-street, Adelphi, Londou; morning meetings at 12, and evening meetings at 7, as usual. Papers on the principles of naval construction; on practical shipbuilding; on steam navigation; on the equipment and management of ships for merchandize and for war, will be read. Gentlemen who propose to read papers should send immediate notice of the subject rar, will be read. Gentlemen who propose to read apers should send immediate notice of the subject papers should send immediate notice of the subject and title of the paper to the secretary at the offices of the Institute, 9, Adelphi-terrace, London; the paper itself, with illustrative drawings, is to be deposited at the offices of the Institution, on or before the 18th of February next. Candidates for admission as members, or as associates, should send in their applications on or before the 1st of March

THE manufacture of postage stamps assumes larger proportions every year; during 1868, 500 millions were produced.



SWING BRIDGE OVER THE CALEDONIAN CANAL.

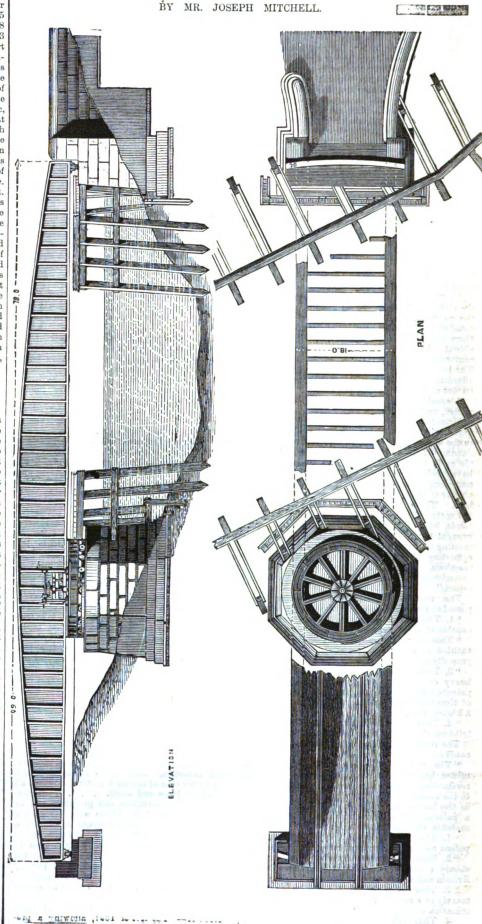
THE Highland Railway works consist of a main line from a point near Perth, extending northward 117 miles to the town of Forres, and a base line running nearly at right angles to the other, extending westward from the town of Keith by Elgin and Forres, along the shores of the Moray Frith to Inverness, and thence along the Beauly, Dingwall and Dornoch Friths, northwards to Bonar Bridge, measuring from Keith to Inverness 55 miles, and from Inverness to Bonar Bridge 58 miles, and making together a base line of 113 miles. These railways traverse the northern part of Perthshire, and are the main lines of communication through part of Banffshire and the counties of Inverness, Nairn, Moray and Ross, the whole including three branches, two to the ports of Burghead and Findhorn, in Morayshire, and the other to the village of Aberfeldy, in Perthshire, xtending to 245 miles in length. The railway at one point crosses the Caledonian Canal, over which t is carried by the swing bridge illustrated in the iannexed engraving, where the structure is seen in elevation, plan, and transverse section. It was designed by Mr. Joseph Mitchell, the engineer of the line, and is a good example of a swing bridge. It consists of two girders of 126ft. in length, 78ft. of which, from the centre of the turntable, spans the canal, and the remaining 48ft. forms the balance weight. Advantage was taken of the canal being emptied for repairs to lay the foundations of the masonry, which are on a platform and piles in the solid gravel, 9ft. below the surface of the water. The depth of the canal is 18ft., and the width of the lock is 40ft., the canal banks being 120ft. apart. Some difficulty occurred at first during hot weather from the expansion of the iron affecting the adjustment of the bridge, which was remedied by means of a powerful screw, and the bridge has been worked with satisfaction and safety for the last five years. This bridge, with its machinery, timber wharves for protection from vessels, distant and station signals, &c., complete, cost

## HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

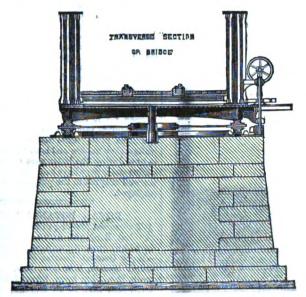
ON Wednesday week a general meeting of this Society was held in Edinburgh; the Duke of Buceleuch, president, in the chair. On the motion of the chairman, the Marquis of Tweeddale was elected president for the ensuing year; and the Earl of Southesk, the Earl of Kintore, the Earl of Dalkeith, and the Right Hon. R. C. Nisbet Hamilton were elected vice-presidents. The other office-bearers having been appointed, Sir William Gibson Craig moved a vote of thanks to the Duke of Buccleuch for his services to the Society while president. Sir William Stirling-Maxwell seconded the motion, which was cordially agreed to. His Grace, in acknowledging the compliment, said that during the three years he had held the office of president, 313 new members had been added, and there had been an addition of £4,862 made to the vested had been an addition of £4,862 made to the vested capital of the Society. Among the new members admitted on the occasion were the Marquis of Queensbury, the Marquis of Bute, the Earl of Perth, and Lord Schomberg Kerr. Mr. Kinloch, jun., of Gilmerton, reported that the show held at Aberdeen last year, although a successful one, had cost the Society something like £450. He stated that the arrangements for the general show, to be held at Edinburgh this year, were in a satisto be held at Edinburgh this year, were in a satisfactory state of advancement. The prizes offered amounted to nearly £1,500, irrespective of the value of the medals which might be awarded for extra stock, and for the first prize animals at former shows. It was arranged that the show should be held on the 28th, 29th, and 30th of July. In regard to the show of 1870, it was reported that a requisition had been received from the Dumfries district, asking the directors to hold the show for that year in Dumfries. It was agreed to comply with the request, and to make arrangements accord-ingly. Mr. Campbell Swinton, of Kimmerghame, reported that during the past year local shows of stock for premiums given by the Society had been held in fourteen districts, and that a sum of about £250 had been awarded, besides a number of medals.

The number of lime kilns in Italy in 1867 was 4,971, and produced 5,799,383 metric quintals of lime, of the value of 11,557,200 francs. The kilns for burning chalk for agricultural purposes were 891, and produced 1,080,372 quintals, of the value of 1,603,670 irancs.

# SWING BRIDGE OVER THE CALEDONIAN CANAL-HIGHLAND RAILWAY.



### SWING BRIDGE OVER THE CALEDONIAN CANAL-HIGHLAND RAILWAY.



#### REMARKS ON WAR ROCKETS. BY MR. J. B. DANCER, F.R.A.S.\*

T the last meeting of the Society a communication from Mr. J. Nasmyth was read on rockets. I was not present at the meeting, war rockets. but have read the paper, and I propose to make a few remarks on the subject of his paper, and to suggest some other method for obtaining similar

Rockets have been employed in warfare from a very early period. They were used by the Chinese in their wars with the Tartars in the thirteenth century; by the Venetians in 1380; and by the French in 1449. They were also employed against our troops by Tippeo Saib at the siege of Seringapatam. The merit of the introduction of this amongst our engines of war is due to Sir William Congreve, who in 1804 very materially improved the rocket for purposes of war, by making them of large size and giving them a greatly extended range, averaging 3,000 yards. greatly extended range, averaging 3,000 yards. Since that time Congreve's name has generally been connected with the war rocket. He had a very high epinion of the importance of these very night opinion of the importance of these projectiles, and thought that rockets from half a ten to a ten in weight might be employed in reducing fortresses. Their efficiency in our hands has been very recently shown against King Theodore's troops at Magdala. It does appear strange that a weapon which combines so many desirable qualifications should be so long neglected. whilst guns, which are so much more cumbrous and expensive, should receive so much attention.

want of precision in the flight of the rocket has doubtless been one reason which has prevented it from being employed more extensively. This deficiency has been in some degree removed by the improvements introduced by Mr. Hale, who suggested that a number of oblique perforations should be made near the nesk of the rocket, through which the ignited composition could escape, and thus impart a rotary motion to the tube of the rocket.

Mr. Hale, who suggested by Mr. Hale, who suggested that a number of oblique perforations should be made near the nesk of the rocket, who was a suggested that a number of oblique perforations should be made near the nesk of the rocket, through which the ignited composition could escape, and thus impart a rotary motion to the tube of the rocket.

Mr. Nasmyth's ingenious contrivance for effecting the rotation of the rocket from the commencement of its flight would doubtless be a very great improvement, but there are certain considerations connected with the efficient employment of rockets which render it very undesirable that that branch of the service should be encumbered with any apparatus, especially mechanism, which could be easily rendered useless by accident or design; and to protect the wheelwork from rifle bullets by iron casings would render the apparatus too weighty for active warfare. At present, rockets are a light and simple artillery which can be rapidly manœuvred; they are not liable to derangement of parts, and they afford a small target for the enemy's riflemen.

The question which occurred to me whilst reading Mr. Nasmyth's communication was this—

. Manchester Literary and Philosophical Society.

Is there any mode of imparting precision of flight to a rocket without adding any machinery liable to derangement or materially increasing the weight of the present apparatus. The first scheme which suggested itself was to replace the present V-rest with a long rifled tube, and to enable this tube to impart the rotary motion to the rocket case, it would be necessary to rifle the outside of the rocket case to correspond. This could be added in several ways to the present cases. One method, which would be expensive in degree, would be to force the rocket case into a rifled sheet iron tube—these tubes could be easily made of thin sheet metal in a draw bench, on a rifled mandril, by means well known to mechanicians. In this way we should have a rifled rocket case which would receive a rotary motion at the commencement of its flight from the rest. If the friction caused by its flight from the rest. If the friction caused by the rifling proved objectionable, possibly by closing the end of the tube rest an additional impetus at the commencement of the flight of the rocket would be obtained. A small charge of gunpowder, or preferably one of gun cotton, placed at the end of the rocket composition during the manufacture, might be the best method of overcoming the

A new form of rocket stand would unfortunately be required under these new conditions. If rifled rockets proved a success, it would be easy to give the cases the proper rifling to commence with. As I have before stated, iron tubes of the desired strength according to size of rocket, could be drawn on rifled mandrils. I should prefer that the rifling of the cutside and inside of the cases should correspond, and should expect that the issue of the ignited composition through the rifled interior, would materially assist in continuing the rotation after the rocket had left the rest, acting in the same manner as Mr. Hale's oblique orifices. Considerable accuracy of aim might be obtained without rifling the rocket case. If we wish to give an arrow precision of flight, we affix feathers to one and of the shaft to act as rudders, reathers to one end of the shart to act as rudders, and if these feathers are placed exactly in a line with the shaft, we have directive power without rotation. I would therefore propose experiments to be made by attaching thin metal feathers to the rocket case; these could be attached to the rockets now in use by crimping up, or corrugating thin sheet metal into feathers, or rudders, and forming them into a tube, which could be forced on to the them into a tube, which could be forced on to the them into a tube, which could be forced on to the rocket cases; for those rockets intended to ricochet or for low angles, perhaps, three guides would be quite sufficient, having none at the under side of the case, because they might be knocked off at the first graze, and only tend to deflect the rocket from its intended destination; those for great elevations and long range might be surrounded with a considerable number of feathers, each of small superficial area, to reduce the deflecting power of the wind at great elevations to a minimum. a minimum.

Rocket cases of sheet metal could be so formed the feathers would have the appearance of star-like radiations, the inside corresponding to fire.

the outside. In rockets thus formed the issue of the gases would be in a straight line, and would assist the directive power of the external feathers. Of course, the oblique orifices used by Mr. Hale would not be required in these rockets. The rammers for the composition would have to be adapted to this new form, and the usual V-rest would require one or more parallel guides for the feathers. I should expect feathered rockets to obtain a longer range than rifled ones, and the apparatus would not of necessity require to be more cumbrous than those in present use. I do not profess to have made a study of the subject, therefore, feel it necessary to apologize for taking up your time with suggestions in which I may have been anticipated; but up to the present moment they appear to me to be novel; how far they may be practically useful, I must leave to experimental artillerists to decide.

#### BERTRAM'S PETROLEUM STORE.

MR. BERTRAM, whose safety petroleum store was described and illustrated in the MECHANICS' MAGAZINE, for October 2, 1868, has received a letter from the Metropolitan Board of Works, in which states, that upon examination of the apparatus, it has been considered a safe means of storing this dangerous oil. The Board have re-ferred to it in a circular, which they have drawn up with reference to the operation of the Petroleum Act, and which they have issued to the oil trade. In referring to the various methods of storing, the circular expressly states that the storage "may be effected by an apparatus in which the contents are protected from exposure, and measured in certain quantities on discharge. The specific gravity may also be indicated, and thereby the dealer can ascertain that the oil is of standard quality or otherwise." This special reference to Mr. Bertram's apparatus, and the expressions of the Board on the letter, to which we have referred, are highly gratifying, and must, we are sure, promote the interests of this enterprising inventor.

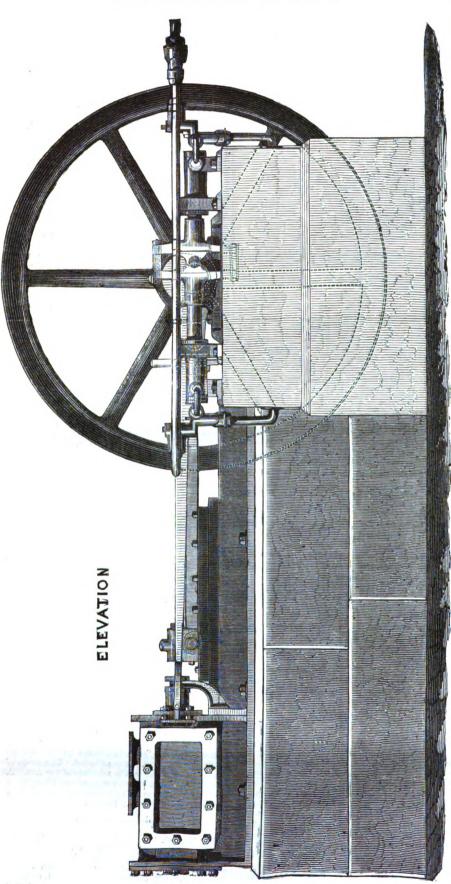
In the interest of many of our readers who are

interested in the storage of petroleum, we append an abstract of the Act with reference thereto, which was passed in July last, and which will take effect on Monday next. This statute is to be construed with the 25th and 26th Victoria, cap. 66. From and after the 1st proximo no petroleum is to be kept, otherwise than for private use, within 50 yards of a dwelling-house er of a building in which goods are stored, except in pursuance of a licence given in accordance with the Petroleum Act, 1862. There may be annexed to any such licence such conditions as to the mode of storage, as to the nature of the goods with which petroleum may be stored, as to the testing such petroleum from time to time, and generally as to the keeping of petroleum as may seem expedient to the local authority. Any petro-leum kept in contravention of the provision is to be forfeited, and, in addition, the occupier of the place is to be liable to a penalty not exceeding £20 for each day during which it is kept in contravention of the Acts of 1862 and 1868. There is a section as to the sale of petroleum for the purpose of illumination. "No person shall sell or expose for sale or use within the United Kingdom, any petroleum from and after February 1, 1869, which gives off an inflammable vapour at a temperature of less than 100deg. Fah., unless the bottle or vessel containing such petroleum have attached thereto a label in legible characters, stating as follows:— Great care must be taken in bringing any light near to the contents of this vessel, as they give off near to the contents of this vessel, as they give off an inflammable vapour at a temperature of less than 100deg. Fah.' Any person acting in contra-vention of this section shall for each offence be subjected to a penalty not exceeding £5." In-spectors of weights and measures are empowered to test petroleum, and offences are to be tried by magistrates, and penalties enforced. The mode of testing is set forth in the schedule of the Act. A definition is given of petroleum, of any bituminous substance that fires off an inflammable vapour at a temperature of less than 100deg. Fah.

On the 11th inst., an accident occurred on the railway running from Pittsburg to Wheeling, about three miles from Pittsburg. A freshet washed away a portion of an embankment; a train ran off the line; a "sleeping car" rolled down a 60ft. embankment, and out of the seven persons it contained three were instantly killed, and the others injured, two of them mortally. As usual, the wreck caught fire.

## HORIZONTAL ENGINE AND PATENT PUMPA COTTON PACKING PRESSES.

BY MESSRS. ROBINSON AND COTTAM.



#### COTTON PRESS ENGINE.

THE accompanying engravings illustrate a horizontal engine and double-acting pump, which are the patented inventions of Messrs. Robinson and Cottam, engineers of the Battersea Works, and by whom they are manufactured. The machines are used in conjunction with a special form of cotton press, of which this firm are also the manufacturers. The engine is of 20-horse power, and the pumps are arranged at each side, as shown in the plan. The pumps are driven by slotted crossheads, in which the cranks on the ends of the flywheel shaft work. The pumps are double-acting, and are peculiarly constructed, one plunger working within the other. The cotton press is constructed on the same principle, and the advantages claimed for it consist principally in giving an extraordinary rapidity of ascent to the ram of the hydraulic press while the cotton is still loose, while a slow motion and heavy pressure is brought to bear during the latter part of the stroke. The engine and pumps have been carefully designed, and are well adapted to the purpose for which they are employed. employed.

ROYAL BOTANIC SOCIETY.

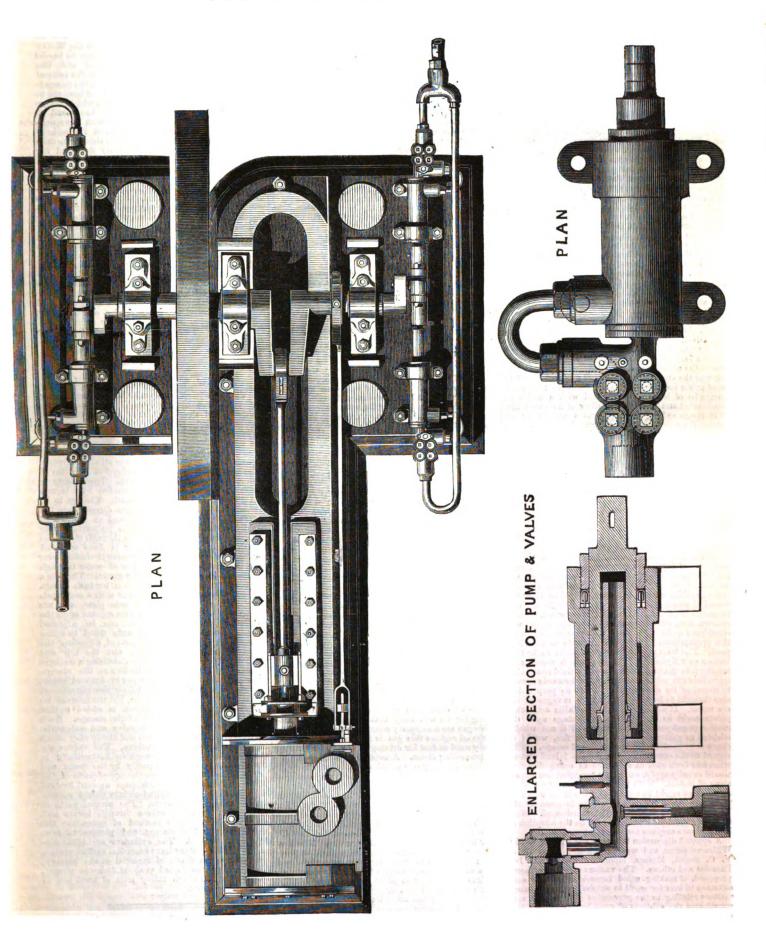
ROYAL BOTANIC SOCIETY.

A Ta general meeting of this Society on Saturday
A last, Benjamin Attwood, Esq., in the chair,
the following were nominated and elected Fellows:
—Major General Charles Stewart, C.B., Captain
Robert Mather, Mrs. Low, Mrs. Webbe, Emanuel
Green, Esq., Mrs. Leon, Edward Hicks, Esq., Mrs.
Bevir, Mrs. Birt, E. H. Brydges Willyams, Esq.,
M.P., Colonel the Hon. Hedworth Jolliffe, Colonel
Alexander Robert Manson, Preston Karslake,
Esq., G. J. Symons, Esq. A curious sample of a
lady's bonnet was exhibited to the meeting by the
assistant secretary, Mr. W. Sowerby. It has just
come from Jamaica, and is said to be made of the
skin of the leaf of a plant. Mr. Sowerby had skin of the leaf of a plant. Mr. Sowerby had examined the substance microscopically, and it agreed in structure with the cuticle of the Yucca, and would most probably prove to be derived from a species of that plant. The material is exceed-ingly pretty and delicate, but not being of a fibrous ingly pretty and delicate, but not being of a fibrous texture is very fragile, and scarcely strong enough for manufacture; the ingenuity of the milliner may, however, invent some plan for "making it up," if the material should ever come into the market. The specimen is placed in the museum, where, although from its antique cut, it may not be very attractive as a fashionable shape, it is none the less valuable as an additional illustration of vegetable substances that are, or might be, used in the arts and manufactures. The museum is found very useful by medical and other students and artists, more especially as the plants from which the various substances are derived, are, as far as possible, cultivated in the department of the far as possible, cultivated in the department of the garden connected with it.

AMERICAN SHIPPING RETURNS.

THE Treasury Department of the United States
Government has published, as a supplement
to Secretary M'Culloch's annual report, a small
pamphlet of important statistics on the tonnage
of the United States, accompanied with a paper
by Mr. Nimmo on the shipbuilding of the Union
from 1817, to 1868, shoring the transfer of 1868. of the United States, accompanied with a paper by Mr. Nimmo on the shipbuilding of the Union from 1817 to 1868, showing a tonnage in 1868 but little more than half what it was in 1855, and very little above what it was in 1847. On June 30, 1868, the total tonnage of the United States, including steam and sailing vessels, barges, and canal boats, we are told, was as follows:—On the Atlantic and Gulf coasts, 2,974,975 tons; Pacific coast, 166,512 tons; northern lakes, 695,604 tons; Western rivers, 581,217 tons; making a total of 4,318,309 tons. The number of vessels which return this tonnage consisted of 18,189 sailing vessels, 3,619 steam vessels, 1,631 barges, 4,679 canal boats; making a total of 28,118. The tonnage in June, 1861, was 5,539,812; in June, 1868, only 4,318,309; a decrease of 1,221,503 tons. In the fiscal year 1854-55, the most prosperous year in shipbuilding, 373 ships and barks were built; in 1867-68 only 69. Mr. Nimmo, showing the falling off in the building of large vessels since the war, says:—"During the five years from 1853 to 1858 65 per cent. of our seagoing tonnage built on the coast consisted of ships and barks, while during the five years from 1863 to 1868 only 28 per cent. consisted of ships and barks, while during the five years from 1863 to 1868 only 28 per cent. consisted of ships and barks; From 1852 to 1862, the aggregate tonnage of American vessels entered at seaports of the United States was more than double that of foreign vessels; from 1863 to 1868, instead of being double, it has declined till it has come to be only 26 per cent. The steam marine gives even more marked returns. till it has come to be only 26 per cent. The steam marine gives even more marked returns.

HORIZONTAL ENGINE AND PATENT PUMP FOR COTTON PACKING PRESSES.



THE CAUSES AND PREVENTION OF MARINE DISASTERS.

THE regular semi-monthly meeting of the New York Society of Practical Engineering was held ■ York Society of Practical Engineering was held at the Cooper Union Building, on Tuesday evening, December 22, 1868, the president, James A. Whitney, presiding. The regular paper of the evening was upon the causes and prevention of marine disasters, and was prepared by Mr. C. Williams, C.E. The subject was treated at length, and several new devices, in addition to those now in use, for the prevention of disasters and for the rescue of wrecked massengers, were suggested and discussed. It was passengers, were suggested and discussed. It was asserted that the greatest and most useful dis-coveries and inventions were those that were intended to secure the most rapid intercommunication between nations and sections of a country, but it could not be said that these improvements embodied the means of safety, as the latter had not probably met with the same encouragement as the desire for rapid travelling. The principal causes of disasters upon the ocean were from foundering, going ashore in storms, gales, or from followering, going asnow in storms, gales, or from false reckoning, the effects of ocean currents, and the destruction of vessels by fire. The causes of disasters upon inland waters, were snagging, burning, and explosions of boilers, The means of safety in case of danger from founder-The means of safety in case of danger from foundering were regarded as being embraced in a vessel so constructed as to secure flotation at a certain depth of immersion, which could be secured by water-tight compartments. It was proposed to attach storm proofs to vessels in such a way that they could be launched or cut loose from the vessel when required. This storm proof could be made of rubber or some analogous substance, and kept distended by iron ribs. A circular shape was thought the best for striking the shore, although they might be made analogous substance, and kept distended by iron ribs. A circular shape was thought the best for striking the shore, although they might be made like a boat, if means could be found to control their direction. It would not require a large one to carry as many passengers as a lifeboat. It was suggested that this plan would also convert the vessel into a life raft, and after a storm had abated, the damages might be repaired, the vessel cleared of water and taken into port, or if not, the passengers could be sustained and sheltered until picked up or land could be reached. In ease of the wreck of a vessel by going ashore, the storm proof, also being surf proof, would afford means for the passengers reaching land. One of the auxiliaries for the prevention of foundering was the steam pump, and this was considered to be of prime importance. It is desirable that such pumps be of large capacity, and with a boiler so constructed and located as to allow of no possibility of stoppage so long as there was a probability of saving the vessel. It was advocated that all vessels above a certain tonnage, should by law be compelled to carry such pumps. In considering disasters by going ashore, the various causes were referred to, such as storms and gales, errors of reckoning, effects of currents, mistakes in soundings, &c. Asto errors of reckoning, if some inuroved means could be of currents, mistakes in soundings, &c. Asto errors of reckoning, if some improved means could be devised for accurately determining the position of the wave by dead are known by the more recommendation. the vessel by dead reckoning, by arriving with more accuracy at the course and distance sailed, the amount of leeway and the effect of the currents, they would be of untold advantage to the navigator. I is also desirable, and thought not to be impracticable, of obtaining some means of almost instant soundings at all times, and to give an alarm when a certain minimum of depth of water was reached. In conminimum of depth of water was reached. In considering the means of preventing disasters at sea and on inland waters, the steam pump was thought indispensable, as it could be employed to clear the indispensable, as it could be employed to clear the vessel of water, and also to extinguish fires. The preparation of the timbers and woodwork, during construction, with some fire-proof preparation, was considered quite possible and not expensive, after the preparations for it had been made at the ship-yard. The least expensive was thought to be that known as "Kyanizing" process, which consists in forcing into the pores of the wood a fluid containing ingredients in solution, which are afterwards turned to stone, or its equivalent. Wood so prepared is also thought to be proof against the ravages of the sea worm. It was thought that metallic and other sea worm. It was thought that metallic and other paints could be employed to advantage upon the most exposed parts of steamers and if not wholly most exposed parts of steamers and if not wholly adapted to prevent the progress of fire, would so check it as to allow of some means of escape. With regard to the causes of disaster upon inland waters, what had been said in reference to ocean disasters would equally apply, excepting snagging and explo-sions of boilers. With the former the danger is not would equally apply, excepting snagging and explosions of boilers. With the former the danger is not so great as might be expected, when it is borne in mind the great number of snags in some of the Western rivers, especially the Mississippi. With the latter the best remedy would be the adoption of low pressure engines for all passenger boats.

A spirited discussion followed the reading of Mr. William's result was a superconstituted in the control of th

A spirited discussion followed the reading of Mr. Williams' paper, and was participated in by Dr. J. V. C. Smith, Messrs. Holms, A. W. Hall, Dr. Pamelee and others. The various methods hitherto proposed, of making wood incombustible, the substitution of iron for wood in shipbuilding, and other matters relating to the prevention of disaster at sea, constituted the subjects of consideration until a late hour, when the Society adjourned for two weeks. At the next meeting the subject of concrete for building purposes will be taken up.—"American Railway Times."

NATURAL GAS.

WHAT the interior of this globe of ours hold, whether it is a solid, a void or vacuum, or a seething mass of molten rocks, a globe of liquid fire, we do not really know. The phenomena of earth-quakes, volcanoes, boiling springs, &c.; the increasing heat as the earth is penetrated; the fact that the temperature is greater at the surface of the earth, or the sea level, than above it, and the escape of inflammable gas from artesian wells, seem to point to an internal inferno of iron. Centuries ago these phenomena were noticed, and their existence used as an evidence of a hell, the locality of which was the centre of the parth. Still, no one of these, nor all taken together, is absolute proof of an incandescent interior. We have never yet penetrated the crust of the globe, nor even probed the crater of a volcano and reached the great internal cavity. If the crust is, as has been estimated, about thirty miles thick, the amount of force necessary to raise the tons of liquid lava to the orifice of a mountain is simply inconceivable, and its effect on the surrounding walls and the surface would be sufficient to materially change the physical characteristics of the country for hundreds of miles around. So, if the earthquake receives its impetus of motion and its almost incalculable power from the agitation of an internal sea of liquid igneous matter, confined within a crust of thirty miles in thickness, and the throes of this sea are transmitted and communicated through this mass to the surface, would the most disastrous carthquake known to history or tradition be sufficient to account for the exercise of such a power? The force that could be sufficient to turn our continents into bottomless seas and our oceans into mountainous deserts. At most, we have a shaking of the surface, a superficial disturbance of the ocean; but no disappearance of the sea through some cavity reaching the molten centre of the globe, and no vomiting forth of a consequent mass of steam, vapour, and lava sufficient to destroy all animal life, and

volcanoes and earthquakes may be accounted for without descending to so great a depth. If the earth's crust is thirty miles thick, there is ample room for the reservoirs of all the power-generating materials necessary for the production of eruptions and earthquakes. That this crust is not solid or homogeneous is not only proved by theories based on analogous truths, but is actually demonstrated by mining, well boring, and the existence of immense caverns, with plains, and hills, and lakes—a subterranean landscape. The increasing heat of the earth below the surface on more demands a vast internal furnace for its existence than does the superior temperature at the earth's surface over the inferior temperature of the call his or the mountain tops. Both may be assigned to the same, or a similar cause, that of weight or pressure, or both combined. What other occult or unknown causes, as electricity, magnetism, galvanic agencies, the nature of which we do not understand, it is immaterial now to enquire. Suffice it to say, that we know that the earth's crust (to use a familiar term without assenting to the theory of the believers in the igneous philosophy) is not solid, and that it contains explosive and inflammable gases which may be sufficient in quantity and powerful enough in explosive and dangerous quality to produce all the phenomena of volcanic cruptions and earth shakings. The difficulty of accounting for the extended character of these latter phenomena—earthquakes—is no greater than if the theory of an internal globe of liquid fire be accepted, as is evident by the statements made by the supporters of that theory of the thickness of the earth's crust.

theory of the thickness of the earth's crust.

That the earth (not merely its interior, but the crust of the globe) is a gasholder, it would be nonsensical to deny. All our coal, whether bituminous or anthracite, contains inflammable gases; coal mines are infested with it, and many of the delvers in their depths annually lose their lives by its explosion, either from accidental causes or spontaneous ignition. No one who is at all acquainted with the business of boring for oil will deny that emissions of inflammable gas are a necessary concomitant to well boring. In the oil regions this gas is frequently and extensively used as fuel for driving the engines, or rather for generating steam. A notable instance is one we mentioned twenty-one months ago, where we spoke of a large manufactory in Erie, the machinery of which was driven and the buildings lighted by the gas from an unproductive oil well. The establishment is that of H. Jarecki and Co., brass workers. For more than two years they have led gas by means of a 3-inch iron pipe from an unsuccessful oilwell 1.200ft. distant from the manufactory, and used it as fuel for their boilers and as light for their works. The flow is never stopped, never changed in amount of pressure; the gas is of good lighting properties, and when at night or on Sundays the works are stopped, the gas still comes; at night being lighted at the mouth of a pipe of 2in. or 24in. diameter, situated near the top of the main building. This light is sufficient to illuminate several streets and squares in every direction, and the escaping gas makes a noise as of escaping steam, that may be heard at a long distance, while the gas flame is not less than 4ft. or 5ft. high.—" Scientific American."

THE MILITARY ARM OF THE FUTURE.

RE long, the Small Arms Sub-committee which has sat at Woolwich, for three years, engaged in determining what shall be the future weapon of the British soldier, will bring to a close its lingering and costly experiments. The sub-committee—on which the country has spent more than £10,000 during the term of its existence—has most rigidly and carefully tested the nine patterns of breechloading rifle submitted to it; and it has been for some time understood that all the other arms have been practically set aside in favour of the Henry and Martini rifles. As yet, however, there has been no decision on the important point, whether the Henry shall be accepted in its entirety, or whether its barrel alone shall be accepted, and combined with the Martini breech. We sincerely trust, for the sake at once of efficiency and of justice between the competing inventors, that the committee will not he sitate to adopt, frankly and entirely, the weapon which, above all other rivals among small arms, has stood so many, so various, and severe tests, both in experiment and in actual use, with the most triumphant results. We do not now need to tell those who take an interest in small arms, whether designed for sportsmen or for our soldiery, that the Henry weapon is an approved and unnistakeable success—not the breech, and not the barrel, but the whole gun. On the other hand, the Martini is only, as yet, an experiment, which a long time and great trouble might be spent in recommending to the public mind. To combine the two systems therefore, would be totake away so much certain and guaranteed good from the Henry system, and substitute so much uncertainty and chance of inefficiency—not to speak of the public disattisfaction that would be caused by any prejudicial compromise. If it be true, as we know good judges say, that to unite the Henry barrel and the Martini breech would give a weapon inferior to the Henry in its entirety, the authorities have slender room for hesitation. It would be a sorry mode of signalizing the commencement of

#### A NEW STEAM STAMP MILL.

A VERY efficient stamp mill is at present being introduced by the New York Steam Engine Company, and those who have adopted it express themselves thoroughly satisfied with its operation. An excellent illustrated description of the machine has been published in a recent number of the "American Journal of Mining," from which it appears that the stamps which are attached directly to steam piston rods are arranged in a group of four, and surrounded by a screen. The battery in which the stamps work is surrounded by a trough cast in the bedplate of the mill. The ore to be crushed is fed through a hopper directly into the centre of the group of stamps, and so distributed equally to all, and as fast as it is pulverized finely enough it is delivered on all sides through the screen into the trough. The stamping is done wet, and the very finest portion of the powder is washed over from the trough by the overflow of water through spouts into an outer surrounding gutter. There is a separate steam cylinder and piston for each stamp. The cylinders are all cast together with a surrounding exhaust steam jacket, and sole plate, and are supported on wrought-iron pillars erected upon the bedplate. All the cylinders can be adjusted simultaneously by means of nuts fitted to screw threads on pillars, for the purpose of adjusting the clearance between the piston and the top and bottom of the cylinder, and for maintaining a uniform clearance by lowering the cylinders as the stamps wear away and allow the pistons to descend lower. The steam acts above and below the pistons, so that it not only lifts the stamps, but the force of its downward pressure on the piston is added to that due to the weight and fall of the stamps. Each cylinder has an independent valve and automatic valve gear, so that each piston and stamp may work independently of all the others. The valves are short double-faced slides, working horizontally in the chests, and operated partly by the steam and partly by conical surfaces on the upper parts of the piston and stamp

A FINE specimen of the white-tailed eagle was shot in the park here (Chilham, Kent), on the 11th inst.; a male bird, weighing over 9lb., and measuring 7ft. 6in. from wing to wing.

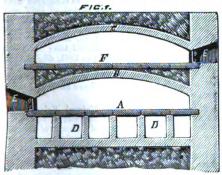


CALCINING FURNACES.

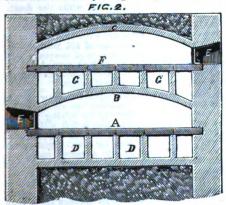
THE ordinary method of heating a close furnace is by passing the flame between the two arches at the top, and then once or oftener under the tiles which form the bottom of the furnace. The invention we are about to describe, and which has been patented by Mr. J. B. Brown, of Walker, Northumberland, consists in converting the space Northumberland, consists in converged, to between the two arches into an open furnace, to which the ore or mineral is first supplied. ore afterwards descends into the space below the lower arch, which space forms the close furnace.

Mr. Brown levels the top of the lower arch so as
to form an upper bed to receive the ore. This lower arch is strengthened, and the distance between the two arches is made sufficient to allow the ore to be worked on the upper bed or top of the lower arch. The flame passes first over the ore on the upper and open bed, and then under the ordinary lower bed to the chimney. By means of this invention the smelter is able to get rid of any excess of sulphur on the upper bed before adding common salt or other chloride to the ore in the lower bed or close furnace. The gases from the lower bed or close furnace. The gases from the two beds are kept separate and distinct, those from the lower bed being collected and condensed, if necessary. Should it be desired that the ore on the upper and open bed be subjected to a lower degree of heat than when in the lower bed or close furnace, this is effected by causing the flame from the fuel to pass first under the tiles which form the floor of the lower bed, and then ascending to pass over the ore on the floor of the upper bed, and thence to the chimney. It may also be effected by causing the flame from the fuel to pass under the tiles of the lower bed, then between the arch of the lower bed, and a set of tiles made to form the floor of the upper bed, and then finally over the ore on the upper bed to the chimney.

Fig. 1 of the accompanying engravings is a



sectional view of a combined close furnace and open furnace, constructed according to this invention. A is the lower bed or close furnace; B is the lower arch, and C the upper arch; D D are the spaces or flues under the tiles of the lower bed A; E E are the working doors. He levels the top of the lower arch B to form an upper bed F. The of the lower arch B to form an upper bed F. The flame passes first over the ore on the upper bed F, and then under the lower bed A, through the spaces D D, to the chimney. If, as we have before explained, it is desired that the ore on the upper bed F should be subjected to a lower degree heat than that on the lower bed A, the flame is caused to pass first through the spaces D D, and then to ascend and pass over the ore on the upper bed F to the chimney. Fig. 2 represents a modi-



fied arrangement of Mr. Brown's furnace, in which spaces or flues G G are formed between the lower arch B and the upper bed or open furnace F. In this furnace the flame is caused to pass through the spaces D D, then through the spaces G G, and finally over the ore on the upper bed F to the THE TITANIFEROUS IRON-SANDS OF CANADA.

T the Lyceum of Natural History, New York, Professor Eggleston mentioned the Moisic iron as being of excellent quality, being in toughness, purity, and fibrous structure, as fine as any in the world. A railroad axle,  $2\frac{1}{2}$ in. to 3in. in diameter, made from this iron, was bent up cold; a stout bar, 2in. thick, twisted till it looked like a corkscrew and could be twisted no longer; and it had been submitted to other tests, all of them signally de-monstrating the superiority of this iron. The monstrating the superiority of this iron. The greater was his astonishment on learning that it had been manufactured from the titaniferous ironsands, occurring at the mouth of the St. Lawrence, at the Moisic Iron Works, under the superintendence of Mr. Molson. Here are two novelties; for, in the first place, the manufacture of iron from any sands had never before succeeded, as such finely comminuted material would choke up the furnace, or sift through the charge without undergoing reduction; in the second place, these sands had the additional drawback of containing 12 to 20 per cent. of titanic acid. The sands are worked in a bloomery furnace, the tuyere, however, entering not at an angle, as is usually the case, but almost horizontally, thus increasing the zone of reduction. All of the titanic acid present goes, as such, into the slag (which shows a remarkable tendency to crystallize and gelatinize with hydrochloric acid), while the magnetite present is reduced, and furnishes the finest The question whether this process will be pecuniarily successful will soon be decided by experiments now going on.

THE GREAT AMERICAN RAILROAD.

MR. J. L. WILLIAMS, Government director of the Union Pacific Pailers. the Union Pacific Railroad, to the Secretary of the Interior, has just issued his report, in which he states the result of a careful professional survey of the first 900 miles of the western 1,100 miles, the portion to be built by this company of the great | railroad across the American continent. Upon the basis of the cost of building these 900 miles Mr. Williams estimates that to complete the whole 1,110 miles of track the sum of 38,824,821 dollars will be required, which gives 34,977 dollars as the average cost per mile, leaving a good round profit to the contractors, who, by the way, are nearly all large stockholders in the road. The items which go to make up this grand total of expenditure include a line of telegraph the entire distance, preliminary surveys, rolling stock, and interest on the capital invested. The road, so far as laid, is not considered up to the proper standard for efficient work, and hence large sums for con-struction will need to be expended for some time after trains shall have traversed the entire dis-Mr. Williams, however, pronounces the work up to the average of new eastern roads, and urges not only the necessity but the advantages finishing it after it shall have been put into actual use. The subsidy granted the company for completing these 1,110 miles of road will amount in all to 29,504,000 dollars, or an average of 26,580 dollars per mile, for which United States bonds, bearing interest at 6 per cent., are issued. A sufficient amount of these bonds are retained in the hands of the Government to insure the completion of the road according to a high standard of engineering. Mr. Williams concludes his report by saying that, when the road is fully completed, it should be subjected to a higher rule of inspection than heretofore, and it will then "invite the through commerce between the two oceans, meet the great national objects in view, and secure safety, certainty, and despatch in its traffic."

#### THE PALMER SHELL.

YESTERDAY week, a new shell, which claims to be more efficient in its destructive powers than any other of its class, was to have been tried at Shoeburyness. A large party of officers and gentlemen went down to witness the trial, but they were disappointed, for it was found that the experi mental shells (64-pounders) which had been made would not fit either the time or percussion fuses of the service, with which they were to be tried. Three attempts were made to use them, but in vain, as far as the shell or its powers were con-cerned. They all burst with a terrific explosion.

downwards with peculiar force. Another claim put forward for it is that it breaks its fragments into more than double the number of pieces of the segment shell, and can be produced at one-third the cost of either the segment or shrapnel. Such claims to merit are about the highest qualifications to approval which any modern shell could well possess; most important of all would be its downward fire. For the purpose of testing the properties which this destructive missile is said to have, a special target was erected. It is made of wooden screens 20ft high, and forms three sides of a square 40ft wide by 60ft deep. The floor is formed of a stout white canvas screen, laid on the earth like a carpet. 20ft. in front of this inclosure an ordinary light wooden target is slung by ropes between stout poles. The percussion shell is intended to burst on passing through this first slung target, so that the screens beyond and the canvas below may at once show the effect of its lateral and downward fire. The shell has been tried on board the "Excellent" gunnery ship, and a favourable report given of its powers, and most especially of the force of its downward fire. experiments at Shoeburyness will be resumed when proper fuses are made.

TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. E. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, Ed. M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

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ments.

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—K. and B.—L. P. S.—E. S.—J. F. N.—R. C.—R. S.

#### Meetings for the Aeek.

Mon.-Royal Institution.-General Monthly Meeting, at

Mon.—Royal Institution.—General Monthly Meeting, at 2 p.m.
Society of Engineers.—Mr. Perry F. Nursey on "Explosive Compounds for Engineering Purposes," at 7.30 p.m.
Royal Institute of British Architects.—A Special General Meeting of Members only, to Consider a Report of the Committee on the Metropolitan Buildings and Management Bill, adopted by the Council, June 22, 1868; at 8 p.m.
Liverpool Polytechnic Society.—The First Meeting of the Thirty-second Session will take place at the Royal Institution, at 6.30 p.m.
The Annual Report of the Council will be read, and the Council for the ensuing year elected; after which the adjourned discussion on the President's Address will be continued.
Royal United Service Institution.—Lieut.-General W. N. Hutchinson, on "Recoil Utilized"; and Lieut. C. P. Stone, 77th Regiment, will Exhibi Models Illustrative of his New Gun Platformt at 8.30 p.m.
TUES.—Royal Institution.—Professor Westmacott, on "Fine Art," at 3 p.m.
The Institution of Civil Engineers.—Mr. James Robert Mosse, M. Inst. C. E., on "The Mauritius Railways, Midland Line," at 8 p.m.
THURS.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.
SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.
London Association of Foremen Engineers.—Ordinary Monthly Meeting. Mr. Laird on "The Epicycloidal Engine, an Effort at Improved Screw Propulsion," at 8 p.m.

THE MANUFACTURE OF WATCHES AND CLOCKS.—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase with their prices, and no one should make a purchase without visiting the above establishments or consultvain, as far as the shell or its powers were concerned. They all burst with a terrific explosion, that sent their pieces roaring and hissing through the air in all directions, but owing to their fuses fitting badly they all burst after passing through the targets and over the sea. The shell is the invention of Mr. F. Palmer, and its chief merit consists in its scattering its deadly fragments, not only in a horizontal and lateral direction, but also

### Nabal, Military, and Gunnery Items.

The total cost of the Prussian war of 1866, as verified by the Berlin Court of Accounts, amounts to £22,624,600, and of which £109,364 was for secret political purposes.

MESSRS. A. STEPHEN AND SONS, of Kelvinhaugh, have contracted to build for Messrs Handyside and Henderson a first-class screw of 2,200 tons, as an addition to the "Anchor line" of Transatlantic steamers.

WE learn that the Porte has purchased the two ironclad corvettes built for the Chilian Government—but rejected for alleged non-compliance with the contract—at Bordeaux. The Greek Government was also negociating for these vessels, but has, presumably, been outbid. The Porte has bought them at the high figure of £180,000.

An impression appears to prevail that, among the new schemes of the Government, will be one to favour a shorter term of enlistment, by keeping a certain number of infantry battalions always at home, and a certain number in effect localized—in short, never relieved—in India. This would have a very beneficial effect in easing the reliefs, and there does not appear to be any serious practical difficulty in carrying out such a plan.

The latest Washington despatches state that Vice-Admiral David D. Porter will be appointed Secretary of the United States Navy, pro tem., and will hold the office until the naval survey, which creates three admirals, is completed and approved. He will thereupon resign and accept one of the three offices so constituted. General Schofield will take position in the Cabinet on the same conditions, and thus the recent projected legislation in the Senate about limiting the number of offices to be held by one person will be avoided in these two particular instances.

IT has been intimated that it is not the intention of It has been intimated that it is not the intention of the Government to fill up the varancy in the Government to fill up the varancy in the Government of Greenwich Hospital for so long a period held by the late Sir James Alexander Gordon, who was in receipt of £3,000 a year from the Hospital funds. On Tuesday last, Mr. Trevelyan, of the Admiralty, accompanied by his secretary, paid a lengthened visit to the Hospital, inspecting minutely the whole building, with a view, it is said, to its being occupied for military purposes, it being the intention, in October next, to remove the infirm pensioners to the hospital at Netley.

Wa ("United Sewrice Grants") we have a labeled to the content of the service of the content of the labeled to the labeled to

WE ("United Service Gazette") understand that WE ("United Service Gazette") understand that important changes have already commenced in the Coastguard Department. The separate establishment in Spring-gardens is, we believe, to be broken up; and the offices of Controller General and Deputy Controller General are to be abolished. Some of the more efficient heads of departments will be transferred to the Admiralty in Whitehall, and a number of the junior clerks either pensioned off or dismissed with a gratuity proportioned to length of service. The intention is, we understand, to amalgamate the various branches of the moribund establishment with the corresponding branches in the Admiralty. the Admiralty.

A GUN carriage and slide of a novel and very ingenious construction, by Messrs. Vavasseur, of the London Ordnance Works, for a 7-inch steel built-up rifled gun, was tested on Saturday, at Yarmouth, with the highest success. The compressor, which is the most important feature, consists of a cone and drum, working under a brakestrap, this friction gear being attached to the lead of a long screw-shaft, actuated by a nut under the carriage, moving along it and turning it round. The great value of the system is that the compressor is always ready to be acted upon by the recoil, and is automatically put into gear the moment the gun is automatically put into gear the moment the gun carriage begins to move.

THE Sydney correspondent of the "Times" writes The Sydney correspondent of the "Times" writes:

The Rifle Association has just finished its matches, and I think when the Wimbledon authorities come to see the results, they will say, there is no better shooting in the world than we show in our "All compering the performances at Wimbledon with the performances at Sydney with the performances at Sydney at the comers' match." On comparing the performances at Wimbledon with the performances at Sydney at the 1,000 yards range, I see that the first man in each was only three below the highest possible score, and that the lowest score made by the first ten men at Sydney was only six marks below the standard, where at Wimbledon the lowest score made under the same circumstances was fifteen marks below the highest possible. This certainly looks like an advantage. The Enfield shooting was not quite so good as last year, but the small-bore was superb.

Armstrong branch has been shut up for a considerable time with all its expensive machinery considerable time with all its expensive machinery, in consequence of a large order being given for the conversion of guns from the smooth bore into rifled guns upon the Palliser principle, to be effected at the Elswick Factory, instead of at the Government establishment at Woolwich.

#### Mliscellanen.

Mr. A. Ashpitel, the well-known architect and archeologist, is dead. He formerly practised at Maidstone, but was latterly best known by his contri-Maidstone, but was latterly best known by h butions to archeological and other journals.

ABOUT eleven o'clock on Thursday night week a lunar rainbow was observed at Edinburgh, its colours being very brilliant. The evening was clear and fine, and the rainbow was seen to great advan-

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending January 23, was 5,177. Total number since the opening of the Museum, free daily (May 12, 1858), 1,487,554.

WE understand that Mr. C. J. Richardson has completed the improvements in his petroleum furnace, and is now making arrangements for a trial on a practical scale. The new furnace has an increased heating furnace without requiring a corresponding increase in the area of the firegrate.

AT Rome, New York, recently, a man was h for murder. A new thing in executions was tried on the occasion. Chloroform the occasion. Chloroform was administered to the prisoner, and as soon as he was insensible the drop fell. There were no evidences of rain and its contact of the drop fell. There were no evidences of pain, and in twelve minutes the pulse ceased to beat.

THE death was announced, on Monday last, of Sir THE death was announced, on monday last, or our Milliam John Newton, painter in ordinary to Her Majesty. He was born in 1785, and having devoted himself to art, gained a high reputation as a miniature painter. He was knighted in 1837, on the recommendation of Viscount Melbourne, who was then Prime Minister.

THE exports of petroleum from Philadelphia during 1868 were 89,457,976 gallons, as compared with 28,751,445 gallons the previous year. Of this export during 1868, Great Britain took 7,915,741 gallons, France 4,196,716, Antwerp 8,480,189, Bremen 5,445,865, Rotterdam 4,302,679, Hamburg 2,398,783, 14-10,2 0.411 963, and Prussia 1.728,109. Italy 3,040,963, and Prussia 1,728,109.

In 1868 dues were paid at the Port of Lynn, on 88,520 tons of coal and 99,623 tons of goods, making 88,520 cons of coal and 99,623 tons of goods, making a total of 188,143 tons. In 1867 dues were paid on 100,470 tons of coal and 86,671 tons of goods, making a total of 187,141 tons. There was thus an increase last year in the movement of the port of 1009 tons. 1,002 tons.

A SHOWER of extraordinary snow crystals fell at Farringdon, Berks, about 12:30 p.m. last Saturday, and extended as far eastward as the Didcot station. They were like small stars, of perfect shape, with five or six points branching outwards from the centre of each. They were of various sizes, the largest about an eighth of an inch in diamater.

Those of our readers whose pursuits tend in a commercial direction, will do well to look into a new monthly journal which has just appeared. Its title is "The Insurance Budget and Commercial World," is "Ine insurance Buaget and commercial world, and its province is to look after public companies, social politics, and mercantile affairs. It is well got up, and deserves the support of that section of the community to which it specially addresses itself.

A FRENCH blue book states that the coinage of gold money in Paris was particularly active during the past year. Between January 1 and November 1, 262,672,380f. worth were struck, of which 80 millions were in five-franc pieces. The administration has made every effort to call in the deteriorated silver coinage, and has succeeded to the extent of 140 millions. On the other hand, it has issued 150 millions of new. millions of new

THE number of visitors to the South Kensing THE number of visitors to the South Kensington Museum during the week ending January 28, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 15,954; Meyrick and other galleries, 3,108; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 2,841; Meyrick and other galleries, 341; total—21,744. 4verage of corresponding week in former years, 10,524. Total from opening of Museum—8,095,368.

ARRANGEMENTS are being made for the construction of iron gun carriages for the navy at the Chatham Dockyard, though recently certain buildings in the Royal Carriage Department, Royal Arsenal, had been altered and fitted up with plant and machinery to carry on the works at agreat cost. The removal of the naval carriages to Chatham will lead to part of the Carriage Department being closed. In the Royal Gun Factory Department, the

UNDER the title of a Permanent Exhibition og Inventions and Improvements, a new section habeen added to the Museum of Agriculture in Bussis been added to the Museum of Agriculture in Russia The object of this new section is to supply those who have invented or improved agricultural machines, implements or methods, with ready means of communication with agriculturists and the public. The machines, models, plans, or drawings are to be exhibited gratis for six months, at the expiration of which time they will be returned to the inventors or destroyed, unless they should have been purchased for the Museum.

On Friday last a most destructive accident occurred On Friday last a most destructive accident occurred at the establishment of Messrs. Martin and Johnson, manufacturers. The mill locomotive engine ran away, making the whole engine-house a wreck of machinery. Two engines of 50-horse power each were smashed into fragments. The flywheel, weighing 30 tons, was broken up, and the fragments thrown about, doing injury in all directions. No lives were lost. Seven hundred people are thrown out of work, and it will occupy six months to repair the damage. The loss in machinery and property is stated at £6,000. the damage. The stated at £6,000.

A curious discovery has been made in the Cathedral Close of Lichfield. In clearing the ground for the foundation of some additional building to the bishop's palace, the ashlar facing of the old palace was laid bare at a few feet below the present garden level. Built up against this wall were found the remains of a pipe manufactory. The flue and the floor of the kiln were very apparent, formed of bricks of a larger size than the present common Flamish pattern. Mixed with the surrounding soil were pipes and fragments of pipes to the amount of one or patients. Mixed with the surrounding soil were pipes and fragments of pipes to the amount of one or two hundred, portions of the unbacked clay still quite moist, scorise and lumps of coal, and in one case, a fully-formed pipe bowl in its unburnt state,

case, a fully-formed pipe bowl in its unburnt state,

THE Australasian gold fields appear to have decidedly increased in productiveness last year. The returns for the year are not finally made up, but it appears that the total value of the imports effected to November 30, was £6,356,192, as compared with £5,291,014 in the corresponding period of 1867, and £6,281,613 in the corresponding period of 1866. In 1867 (whole year) the value of the Australasian gold imported was £5,801,726; in 1866, £6,840,718; in 1865, £5,001,491; in 1864, £2,657,133; in 1868, £5,001,491; in 1869, £8,571,867; in 1869, £8,677,864; and in 1858, £9,066,289. New South Wales, Queensland, and New Zealand all appear to have made increased deliveries of gold last year. deliveries of gold last year.

THE Imperial Society of Natural Sciences of Moscow, whose object is the fitting out of scientific expeditions, the establishment of museums of natural history, and the organization of exhibitions, has just held its fifth annual meeting, and seems to have been activaly employed. As expedition into Turkistan has just been arranged with the assistance of General Kaufmann and M. Henis, and three other avneditions have recently hear fitted out at the or General Kaulmann and M. Henis, and three other expeditions have recently been fitted out at the expense of the Society—one along the banks of the Black Sea, a second to the Lakes of the district of Rissas, and a third to the Lake Fresta in the Moscow district. It proposes, with the aid of M. Daschkoff, an honorary member, to establish an aquarium at a cost of 30,000 roubles.

ost of 30,000 roubles.

PROBABLY, Swanses, situate in the midst of copper smoke, patent fuel smoke, iron works smoke, and smoke from chemical works of almost every description, is one of the healthiest, if not the healthiest, in the United Kingdom, size and population being considered. The report of the medical officer of health of the borough (Mr. Ebenezer Davies) for the past quarter, has just been published, which shows some remarkable figures. Taken over the three months of the past quarter, the annual death rate was only 15-8 per 1,000 of the population, while the death rate for the past month of Desember actually was as low as 12-5 per 1,000. Seventeen persons died above 70 years of age, of whom five were above 80 years, and one woman died at the age of 101 years. The late admirably-constructed system of sewerage and the abundant supply of water, both carried out by the local board of health, have doubtless contributed to this satisfactory state of things.

A CORRESPONDENT from Syracese, New York,

buted to this satisfactory state of things.

A CORRESPONDENT from Syraces, New York, sends to the "Scientific American" an account of an invention perfected in that city for mixing mortar, which is simply this:—The lime is first slaked in a vat with water enough to make it to a paste, and sllowed to retain its heat for about twenty-four hours. It is next run off into a second vat, from which it is pumped by a chain pump to a revolving cylinder that has a large quantity of spikes on the inside. As it flows from the cylinder, it passes through a sieve of tan meshas to the inch, and every particle that is used has to go through these very fine holes no larger than a pin's head. From this machine it falls into a large vat, from which it is pumped as required to a similar revolving machine called the mixing machine, into which it flows in a continuous stream, and sand, previously sifted, is added at the rate of about eighty bushels per hour. The mortar made in this way is said to be of a very superior quality.



### Patents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF **PATENTS**

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILBRS AND FURNACES-2181, 2198, 2226, 2239 BUILDINGS AND BUILDING MATERIALS-2188, 2237

CHEMISTRY AND PHOTOGRAPHY-None.

CULTIVATION OF THE SOIL, including agricultural imple ments and machines-2176, 2233, 2243

ELECTRICAL APPARATUS-None.

FIBROUS FABRICS, including machinery for treating fibre pulp, paper, &c.-2173, 2183, 2194, 2203, 2214, 2219, 2238, 2242

FOOD AND BEVERAGES, including the apparatus for pre paring food for men and animals-None

FURNITURE AND APPAREL, including household utensils. time-keepers, jewellerv-musical instruments, &c.-2180, 2197, 2199, 2205, 2228

GENERAL MACHINERY-2174, 2190, 2195, 2200, 2204, 2208 2216, 2217, 2234, 2235

LIGHTING, HEATING, AND VENTILATING-None.

METALS, including apparatus for their manufacture-2177, 2206, 2207

MISCELLANEOUS-2171, 2172, 2175, 2178, 2179, 2184, 2189, 2193, 2196, 2201, 2202, 2209, 2211, 2215, 2220, 2223, 2224 2225, 2227, 2229, 2230, 2231, 2232, 2236

ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.-2182, 2186, 2187. 2198, 2212, 2218

SHIPS AND BOATS, including their fittings-2191, 2192, 2213, 2241

STEAM ENGINES-2185, 2210, 2221 .

WARFARE-2192, 2222

2171 E. ROUGET, Paris. Fixing drawings on paper. Dated July 9, 1868.

This invention consists in obtaining the fixation of such

Dated July 9, 1868.

This invention consists in obtaining the fixation of such drawings, tracings, or sketches by directly projecting on these latter any suitable adhesive liquid reduced to fine sprsy, or in what is commonly called the atomized or pulverized state, by causing the liquid to pass rapidly under pressure through one or more capillary tubes or openings. By this method the defects of the trunsudation process are entirely done away with, besides which the operation is executed in a less time, and may be performed at once by the artist without the slightest difficulty. As for the fixation liquid, any colourless or nearly colourless liquid, which allows of being atomized, and which, after the coming dry, causes the particles of the charcoal or other drawing materials made use of to adhere sufficiently firmly to the paper or other drawing surface, may serve for the purpose. Thus, for instance, a liquid which has given the patentee the most satisfactory results is obtained by adding to a solution of 302. of white sugar candy and 202. of white shellac, in about two pints of spirit of wine, a decection of about 102. of facus crispus in one pint of distilled water.—Patent completed.

2172 M. BEBRO, Manchester. Ticket deliverer. Dated July 9, 1868.

2172 M. Bebro, Manchester. Ticket deliverer. Dated July 9, 1848.

This relates to two descriptions of apparatus, one intended for portable purposes, and the other fixed or stationary, and may be used on a desk, ledge, or counter. The first part consists in so applying one or more indiarabber surfaced bowls or delivery rollers, and in using them in combination with the interior surface of the lid of the box containing the strips or roll of consecutively numbered tickets, that when the lid is securely closed it presses on the bowls, and when the strip of ticket is between it and the shaft the roller is turned by a handle, the issue of the tickets is thereby effected from an aperture or slot in front of the rollers; a guide is also arranged to ensure the even issue, and a stop plunger to hold the ticket when being form off. In order to ensure the even delivery of the strip, and to prevent it becoming twisted or crumpled, each roller is subdivided into discs, and the divisions so formed in the rollers are filled with a flat plate made to fit between the discs and to extend up to the mouth of the aperture, and the rollersare also enclosed below and within a curved shield, which combined form a guide for the strips; and in order to hold the strip when a tacket is being form off, plungers are so arranged that when pressed outside by the hand they set on the strip and hold it. The size and shape of the box, and number of delivering shafts and rolls of tickets, may vary with requirements. The second part, relating to the fixed or stationary apparatus, consists in transmitting an intermittent movement to the said delivering rollers (the ticket guide being constructed as previously described) by the use of spur and ratchet gearing actuated by a lever or handle, which, when acted upon, expels a ticket from the sperture in the box with each downward movement of

the handle. At the delivery end another roller is arranged by which the strip of tickets may be set or adjusted to the lines of perforations so as to present exactly one ticket beyond the opening, and so prevent the ticket following being damaged.—Patent completed.

2173 W. HADFIELD, Ardwick, Looms, Dated July 9.

2173 W. HADFIELD, Ardwick. Looms. Dated July 9, 1868.

This relates to the two parts of the loom known as the "letting off" or beam motion and the "taking up" or cloth roller motion, and the invention is designed for the purpose of producing, through their combined action and the great precision with which the motion can be regulated, a more perfect, uniform, and even fabric than has hitherto been manufactured. The warp or thread, on leaving the beam, passes around and between two rollers geared together, and between the surfaces of which the warp in its passage is nipped by reason of the top roller being mounted in slide bearings that causes its periphery at their nipping surface or points of contact to be somewhat below the top surface of the under roller, the top roller relative to the bottom being very slightly increased in diameter. The warp, as it leaves the nipping surfaces of the rollers, its delivered and transmitted to the taken up at a more uniform and even tension than hitherto, the tension being up whilst shedding by allowing it to pass after leaving the top roller over an ordinary vibrator. The taking up of the cloth when leaving the breastbeam is effected in a similar manner to the letting off, that is, the cloth is retained or nipped between the periphery or surface of two rollers geared together, their arrangement and position being similar to the rollers stready described, the under roller, in place of the top, being still further increased in diameter, or as an equivalent one of the wheels gearing the rollers may be varied or a little larger in diameter. The cloth is received and delivered from the lower roller on to the cloth roller, where it accumulates in the ordinary manner. Rough material, such as emery or perforated zinc, now in general use for the taking up, is entirely dispensed with. The connection of the letting-off with the taking-up roller is accomplished in the ordinary manner, through the medium of the ratchet wheel, which is provided with a long boss, on which the spur wheel or

2174 J. CHANDLER, Mile End-road. Preventing waste of

2174 J. CHANDLER, Mile End-road. Preventing waste of water. Dated July 9, 1868.
This consists of one cistern divided into two parts, one discharge or outlet valve, one communicating valve, and one ordinary ball valve. In this apparatus the discharge division of the cistern must be capable of containing the maxisuum quantity of water. The opposite division of the cistern contains the ball valve. The ball valve is, from its peculiar position, entirely dependent upon its own self-action in either opening or shutting.—Patent abandoned.

peculiar position, entirely dependent upon its own self-action in either opening or shutting.—Patent abandoned.

2175 E. J. MAYALL, Bridge-row. India-rubber type. Dated July 9, 1868.

In carrying out these improvements, in the case of india-rubber, the patentee combines with, say, 8lb. of that material, 5lb. of sulphur that has been washed or prepared to remove as much as possible of the acid from it, and about 2lb. of whiting, or black or white lead previously dried. The compound thus obtained is then well mixed or ground together by the aid of heated rollers, or other suitable means. When a thorough mixture has been obtained, the matters are placed in a mould or moulds of the desired form, and apply pressure thereto, so that the rubber may fully occupy the parts of such mould to the thickness desired. The mould is then subjected with the contained india-rubber, which has been acted upon by heat, to harden such rubber. Suposing the blocks obtained to be about 10 in. in thickness, then the heat for the first two hours may be about 233deg, then the next two hours about 250deg, the next two hours about 296deg. In treating gutta-percha, the patentee combines with, say, 8lb. of that material 4lb. of sulphur, washed or prepared to remove acid therefrom, and 2lb. of whiting or plack lead, either of which has been previously dried. These matters are then caused to combine together by grinding between heated cylinders, or otherwise. And then, for the hardening process, the gutta-percha so treated is placed in moulds pressed and subjected to heat, which for a thickness of lin. of the material may be for the first hour, 230deg. Seventh hour, 260deg.: fifth hour, 270deg.; sixth hour, 250deg.; seventh hour, 260deg. In treating a combination of india-rubber and gutta-percha, the patentee, to 4lb. of gutta-percha, from which all has previously been removed, 4lb. of india-rubber and gutta-percha,

2176 W. CREASY, Bedfield, Suffolk. Drying grain. Dated July 9, 1868.

This invention consists in the employment of a revolving cylinder through the centre of which, and lying in the same direction, is a fixed hollow tube, supported at the ends by standards or the general framework of the machine; upon this hollow tube the cylinder is arranged to revolve by the application of friction rolls, or by other suitable means. The cylinder is arranged to revolve in a lateral or horizontal position, and when used for operating upon damp grain the patentee prefers clothing it with perforated or woven iron or zine placed around its circumierence. The filling is effected by means of a hopper, from

which there is a passage into the interior of the cylinder, running in a diagonal direction through the stationary tube, and communicating with the hopper to the outside of the cylinder at the upper end with the interior of the cylinder at the lower. The progression of the grain through the cylinder is effected by being carried by the action of the revolving cylinder against some blades, which are fixed at an angle to the stationary tube; it is then discharged at the further end in a similar manner. Sliding valves are conveniently arranged for regulating the progression of the grain or other substances through the cylinder, either at the feed or the discharge end, or both. The quantity of grain or other substance is regulated in the cylinder by the feed pipe, the delivery end of which is brought higher or lower in the cylinder; for instance, if the cylinder is to be kept constantly one-third full, then the delivery pipe would project to the lower part of the cylinder, and if necessary to keep it half full, the delivery would be higher. Some kinds of grain that are washed and dried, such as Exyptian wheats, are treated in the following manner:—A small perforated pipe is employed, which runs through the cylinder by the side of the stationary tube, and is flixed to the eccentric pieces; water is fed into this pipe through an opening in the eccentric piece; when the cylinder is revolving, the effect of this, by the motion of the corn against the blades, and the water descending upon it, is to wash and break up the dirt, which falls with the water through the perforated exterior of cylinder; after being sufficiently washed, the heated air is turned on, and it is dried before leaving the cylinder.—Patent completed.

leaving the cylinder.—Patent completed.

2177 J. HARRIS and V. PENDRED, Dulwich. Iron and steel. Dated July 9, 1868.

In carrying out this invention, a furnace is constructed of the reverberatory type, in which is placed a grate at one end, separated by a brick bridge from a forging hearth or chamber. This chamber or forging hearth is fitted with three openings, one at the end opposite the grate; the remaining two are disposed one at each side and opposite each other. The openings are fitted with suitable doors, by which they may be closed at pleasure. At one side of this furnace is erected a horizontal steam hammer, and at the other a hydraulic anvil. The hammer is so disposed that its head or tup may enter one of the lateral openings, while the hydraulic anvil may be introduced through the other to a distance which may be regulated at pleasure. Any requisite quantity of cast iron is melted in one or more pudding furnaces, and puddled in the ordinary way; as soon as the iron has come to nature, it is converted into balls or blooms in a way well understood and commonly practised. The puddler then takes one of these balls and places it in the forging hearth before mentioned, which is maintained at a high temperature by the heated air and products of combustion proceeding from a fire previously made on the grate. The anvil is then introduced, and the steam hammer is caused to strike and flatten the ball thus introduced. The puddler then brings another ball, which is placed close to the first, and welded to it, and other balls are introduced, and welded to the flort wo, until a mass of the required size is produced, when the anvil is withdrawn, and the mass is pushed out of the forging hearth, through the opening provided for the introduction of the anvil, on to a suitable truck or other contrivance, and is then taken away to be rolled, hammered, or otherwise dealt with.—Patent completed.

2178 J. MABSON, Norwood. Swimming apparatus. Dated

2178 J. MABSON, Norwood. Swimming apparatus. Dated July 9, 1868.

This apparatus consists mainly of a flexible blade or surface, shaped like the tail of a flexible blade is carried on the end of a longitudinal beam, bar, or tube, the opposite end of which is connected to a belt to be passed round the waist or body. A crossbeam, bar, or tube is jointed to the longitudinal beam, and the ends of this crossbeam carry suitable appliances for securing the feet beam carry suitable appliances for securing the feet thereto; rods lead from the ends of the crossbeam to the outer end of the longitudinal beam near the blade.— Patent abandoned.

Patent abandoned.

2179 H. H. DOTY, Bury-street. Signalling lamps. Dated July 9, 1863.

This consists of a hollow vessel for obtaining petroleum or other hydrocarbon oil, supported on a stand, and having an aperture through its centre for the admission of air to the flame. A tube having a nozzle at its upper end passes up through the aperture, and is in connection with an air pump, by which means a current of air is forced through the nozzle at the end of the air tube. Close to the critico of the nozzle, and at right angles thereto, is another nozzle lixed on a pipe in communication with the petroleum or other hydrocarbon oil. The draught caused by the current of air creates a vacuum in this pipe, thereby drawing the petroleum or other hydrocarbon oil up the pipe and ejecting it from the nozzle and the form of spray, which is ignited by the flame of an oil lamp placed in or on the oil vessel, the flame burning close to an aperture opposite the nozzle through which the spray is ejected. The petroleum or other hydrocarbon oil is fed to the oil vessel through an opening closed by a screwed cup or other contrivance. A covering of wire gauze or other suitable material is placed over the flame to provent its being extinguished by wind or draught, and beneath the oil vessel is a pan for catching particles of spray that have not been ignited, the said pan being emptied when required by a cock affixed thereto. Resting on a bracket placed around the oil vessel, or on the oil vessel itself, is a hexagon or other shaped glass lantern, having strengthening ribs up its sides and supplied with a metal or other covering, having an opening at the top for the escape of the heat. A reflector of any suitable material is placed over three sides of the hexagon or about one-half of the glass lantern, so that on turning it slowly more prolonged flashes result, or the flashes may be caused by turning as cook in the hose connecting the "light" with the air pump. Also in grooves formed by the strengthening ribs various coloured pieces of

2180 T. NUTTALL, Bury, Lancaster. Harnes. (A communication). Dated July 9, 1863.

The patentee covers the portion of the body of the collar that is brought in contact with the horse with a fabric whose exterior surface has been rendered waterproof by a



coating composed of vulcanized caoutchout or guttacoating composed of valcanized cacutchout or gutta-percha, or any other composition possessing a sufficient portion of the said gums to produce an elastic and durable waterproof coating on woven fabrics. Similar waterproof fabrics are also employed for the bearing surfaces of riding and harness saddles, and any harness bearing on the horse.—Patent abandoned.

2181 W. R. ASTWALD, Sunderland. Tube joints. Dated

2181 W. A. July 9, 1868.

This consists in making ferrules or short tubes of compressed paper for the ends of the tubes of, say, surface condensers, and fixing the paper so as to form a tight joint between the plate and the condenser tube.—Patent com-

2182 T. WORTH, Rochdale. Railways. Dated July 9

2133 I. WORTH, ROCHORIE. Ratings. Dated July B. 1868.

This invention consists, firstly, in a method of dispensing with turntables, for which purpose the patentee proposes to lay rails in a curve leading from one line to another; when, therefore, the engine is run round the curve, it becomes reversed upon the other line without the use of a turntable. Second, in a method of dispensing with chairs. For this purpose longitudinal metallic sleepers are employed, and the rail is riveted or bolted thereon. The longitudinal sleepers are formed with or without vertical flanges bolted together to form a continuous length, and crossbars are adapted from right to left hand rail, by which means the rails are kept at correct distances apart. Or instead of bolting or riveting the rails to the longitudinal sleepers they are formed in one piece.—Patent completed.

rail, by which means the rails are kept at correct distances apart. Or instead of bolting or riveting the rails to the longitudinal sleepers they are formed in one pieco.—Patent completed.

2183 A. M. CLARK. Chancery-lane. Looms. (A communication). Dated July 9, 1868.

The improvements consist, first, in an improved combined arrangement of temple or stretcher and take up; second, in an improved arrangement of warp thread bobbin. It is well known that in weaving corsets, gaiters, and such like articles of irregular form, the weft is first passed across the entire width of the warp foundation, and in making the neck or hip of the stay, for example, the threads are woven to the right or left of the warp, that is to say, the weft, as the weaving proceeds, is passed through a gradually decreasing number of warp threads, so as to form a gusset. The weft is then again passed through the whole breadth of the warp, a second gusset made, and so on, until a sufficient number are formed to obtain the necessary fulness at the neck or hip of the stay. When the weft passes through all the warp threads, the rollers revolve at equal speeds and take up the full width of fabric; and when, on the contrary, the weft only passes on one side of the fabric, through a certain number of warp threads, the cards of the jacquard are pierced, so that those rollers only turn which are opposite that portion of the fabric. The connection of this system of regulators, working independently of each other, to form the gussets, it may happen, by reason of a disarrangement of the jacquard mechanism, that some of the hooks will not catch or pierce the card, producing a draft. In this case, an opening would be left in the fabric, and supposing the hook were not raised, a ridge would be formed by the fabric being drawn together. Further, in order to facilitate the operation, supposing the width of the jacquard requires forty cords for raising the lovers of the rigulators, it is difficult to pass the hand through to connect any of the warp threads whic

Patent completed.

2184 J. H. JOHNSON, Lincoln's Inn. Murical instruments. (A communication). Dated July 9, 1888.

The invention relates principally to that class of wind musical instruments known as accordions, and to other musical instruments provided with free reeds or tongues, and consists in the adaptation of the planoforte system of keyboard without impairing the impressiveness of the instrument, and in the application of other improvements, whereby a more regular action of the bellows, and a greater compactness of the parts, are obtained, and the harshness of tone to which the ordinary instruments of small size are liable, is considerably diminished. The patentee employs a double pair of bellows on the system used in ordinary organs which work with a crank or handle, but in lieu of using a bellows composed of one movable part, two movable parts are employed for each pair of bellows, such parts being connected together by wire at their moving extremity, and space being left between them to admit air through the valves with which they are provided. These movable parts are hinged at their other ends to the top and bottom sides of the bellows, instead of a fixed plece attached thereto, as in the ordinary manner.—Patent completed.

2185 W. L. G. WRIGHT, Lanark. Rotary engines and

2185 W. L. G. WRIGHT, Lenark. Rotary engines and pump. Dated July 10, 1868.

The specification of this patent is very voluminous. The patentee claims two concentric annular cylinders having open ends, the covers being fixed to the framing. Second, the pistons which are hinged and made to slide back into recesses. Third, the mode of packing the gravitating pistons, and the switch stuffing box; and, fourth, the placing of a condenser in the casing, all as described.—Patent completed.

2186 E. T. HUGHES, Chancery-lane. Wood parement.
(A communication). Dated July 10, 1868.
The patentee employs two sets of blocks or a set of

blocks and strips. One set of blocks forms, when the pavement is completed, the wooden surface of the pavement, and the other or auxiliary set of blocks, and forms no part of the wooden surface of the pavement, but determines the size of the groove or channel way between the principal blocks, which is afterwards to be filled with broken stone, gravel, and tar.—Patent completed.

2187 C. E. BROOMAN, Fleet-street. Cutting and utilizing drailway rails. (A communication). Dated July 10,

1868.
The rails are cut longitudinally about the middle of the web connecting the head and the bottom or the two heads in the case of double headed rails. This is effected by guillotine shears, in the manner described.—Patent abandoned.

2188 G. DAVIES. Lincoln's Inn. Filling spaces between floorings. (A communication). Dated July 10, 1868. This consists of hollow filling pieces of peculiar form, made of brick earth pressed into moulds and dried in the air; without burning. These are placed between the iron beams or joists of the flooring or ceiling.—Patent abandoned. abandoned.

abandoned.

2189 J. JEFFREYS, Tottenham Court-road. Stude and buttons. Dated July 10, 1868.

The head of the stud or button is made of a crescent shape, by stamping out or otherwise removing a portion of the disc. The horns or points of the crescent are more readily introduced into the button hole than the disc, it being simply necessary to insert either end of the crescent. being simply necessary to insert either end of the crescent-shaped head and then partially rotat he stud, in order to attach it to the article.—Patent completed.

shaped head and then partially rotat so he stud, in order to attach it to the article.—Patent completed.

2190 J. D. CHURCHILL, Oxford-street. Hot-air engines.
Dated July 10, 1868.

This relates more particularly to the formation of the bedplate in which the air passage is cast on or attached to its under side. This passage turns upwards and communicates with a vertical air passage cast on or attached to the receiver or main casting which contains the fire-box.—Patent completed.

2191 F. R. A. GLOVER, Isle of Wight. Fishing ships' anchors. Dated July 10, 1868.

The patentee adapts to one of the arms of the anchor a many ship is capable of sliding or varying its position along the arm of the anchor from the crown to the palm. This ring may, if desired, be hinged or jointed, so that it may be removed from the anchor, if required, and to it is attached a light chain of sufficient strength to lift the anchor. The other end of this chain is attached to any convenient part of the cable, so that, if desired, it may be drawn therewith through the hawse hole, in order that it may be laid hold of for the purpose of lifting by its palm the anchor to the cathead, and thereby fixing the anchor.—Patent abandoned.

2192 G. DAVIES, Lincoln's Inn. Armour. (A communication)

—Patent abandoned,
2199 G. Davies, Lincoln's Inn. Armour. (A communication). Dated July 11, 1868.

On a basis of rough network or cellular structure is secured another series of bands slightly narrower than the preceding, and by adding alternate ranges of longitudinal and vertical bands of decreasing widths until the required thickness is attained, the result being the formation of a series of rough pyramids, more or less square, and more or less perfect. To this network is bolted or otherwise secured a plate of malleable iron for the double purpose of producing an even surface, and of hermetically closing the pyramidal cells, so as to prevent the deposit or accumulation therein of water.—Patent abandoned.

2193 W. Russell. Lamb's nassace. London. Paper bag.

closing the pyrainidal cells, so as to prevent the deposit or accumulation therein of water.—Patent abandoned.

2193 W. Bursell, Lamb's-passage, London. Paper bag machinery. Dated July 11, 1868.

To the end of the bag or envelope machine a frame is attached, over which the continuous sheet of paper passes in its passage to the machine to form the bags. This frame carries a transverse shaft working in bearings, at either side of frame to which shaft are keyed two cutters or stamps, one at either side of the strip of paper, at such a distance apart as to cut off a narrow strip from both edges of the paper each time the cutters are brought down thereon.—Patent completed.

2194 T. Travis. W. H. Prince, and J. Tominson, Rochdale. Finithing yarn, &c. Dated July 11, 1868.

This consists in applying a gas burner or other equivalent to act on the yarn or thread as it passes from one of the spools or bobbins around which it is wound to the other, or before or after it has passed round the caps, spools, or bobbins, or other friction apparatus.—Patent completed.

2195 J. S. Nibes, Birmingham. Pumps. Dated July 11

2195 J. S. Nibbs, Birmingham. Pumps. Dated July 11

1868.

A single piston rod is employed, which is provided with two valves, one valve being attached near the centre of the piston, and the second at or near its lower end; a third valve is secured at or near the bottom of the cylinder and below the lowest valve of the piston; the piston rod is worked up and down in the cylinder by means of a handle, and the cylinder is furnished with a base or foot rest for steadying the action of the pump.—Patent abandoned.

doned.

2196 T. King, Spitalfields. \*\* Bungs. Dated July 11, 1868.
A ring is screwed into the ordinary bung hole of the cask until the fiange rests upon the surrounding surface; screws or rivets may be inserted into these holes, and the cask stave for greater security. Beyond the diameter of the internal screw a recess is formed in the fiange end, with a half circular groove in the face of it. The inner ring, which is sometimes made solid, is formed with a thread or screw on its external surface, and a fiange at one end, of a diameter slightly less than that of the recess formed in the fiange of the outer ring; likewise a corresponding half circular groove cut in the under side of the fiange, and into this groove a ring of india-rubber or other suitable substance is inserted.—Patent abandoned.

2187 B. MACKIE Stewarton. N.B. Cane. Dated July 11.

2197 R. MACKIE, Stewarton, N.B. Caps. Dated July 11,

This consists in stiffening the crowns of "Scotch caps" by the employment of an agent, such as shellac, in order to make it more handy to lift on and off the head.—Patent completed.

completed.

2198 J. D. BRUNTON, Kentish Town. Tools for cutting rock. Dated July 11, 1868.

This consists of a chisel, the cutting edge of which is curvilinear, or of the nature of a gouge, bevelled towards the hollow or concave side, and straight down the back or convex side, the object of which is to cause the chisel to cut grooves or slots in the rock, either in sits or when detached from its bed. The machine to which the tool is attached consists of a bed, with slides resembling a lathe bed, so constructed that the chisel, when in operation,

may be moved the whole length of the intended groove to be cut, and as close as possible to one side of the bed.— Patent completed.

Patent completed.

2199 C. E. BROOMAN, Fleet-street. Locks. (A communication). Dated July 11, 1863.

This consists in providing locks, chiefly for post-office purposes, with wheels or indicators, each marked with the figures 0 and 1 to 9 inclusive, which wheels or indicators are connected with certain mechanism inside the lock, so that the lock cannot be opened without a change being made in the numbers on the indicators, as seen through small apertures in the face of the lock. The numerals on the said indicators are capable of 999 changes more or cless, which changes cannot be repeated without the destruction of a seal made of lead or other material.—Patent completed.

Patent completed.

2200 H. GARSIDE, Manchester. Cutting files. Dated July 11, 1868.

The cutting tool is held at the lower extremity of a ram which slides freely in guides attached to or forming part of the framing, and to which ram a reciprocating motion is given by the combined action of a cam on the driving shaft, which lifts the ram, and a spring which re-acts and gives the necessary blow. The feed motion for spacing the teeth consists of a guide screw working in bearings at the ends of the bed, actuated by a ratchet wheel and pawl, and engaging with a clasp nut attached to the slide.—Patent abandoned.

2201 E. EDWARDS, Baker-street. Photography. Dated

2201 E. EDWARDS, Baker-street. Photography. Dated July 13, 1868.

This consists in rendering gelatine, &c., insoluble by the use of ammonia-alum, iron-alum, and other substances containing similar properties, so that photographs may be taken and fixed on the gelatine so prepared.—Patent completed.

pleted.

2202 J. N. WILLIS and S. Judd, Gravesend. Comb syringe. Dated July 12, 1868.

The syringe of india-rubber, or some other elastic material, is connected by a screwpiece and a comb which has a hollow back; small holes are pierced through the teeth or between same, as occasion may require, into the hollow back. The syringe when filled with oil, dye, hair wish, or whatever material desired to be used, is connected with the comb by means of the screw, and together form one article.—Patent completed.

2202 W. J. Hanger Clerk heaten. During. Dated Intel 18.

2203 W. J. HANSON, Cleckheaton. Dyeing. Dated July 13

This consists in enclosing or covering the hanks or slivers with netting or netted fabric, canvas, or other open fabric, to prevent them being rubbed during the process of dyoing.—Patent abandoned.

2204 G. B. PURICELLI, Bedford-square. Printing. Dated

dycing.—Patent abandoned.

2204 G. B. PURICELLI, Bedford-square. Printing. Dated July 13, 1863.

The apparatus in this invention consists of a spring cylinder fitted to rotate on a fixed axis, carried on a frame provided with a handle. Around the circumference of this spring cylinder is placed a strip of india-rubber or other material, on which are formed the letters or design to be marked or printed. An adjustable inking roller is mounted in bearings on the frame in front of the printing cylinder against which it is caused to bear by the aid of springs attached to the movable axis of the printing roller. On either end of the printing cylinder is raised an india-rubber band or rim, against which the inking roller bears, rotating as well as against the type or design on the cylinder, so as to ensure an unif-rm pressure. When in use the printing cylinder is passed once over the surface, to be marked so as to coll its spring, its revolution producing the desired impression, during which time the inking roller maintains a constant supply of ink to the type. The apparatus is then removed from the material, and the cylinder returns to its normal position by the uncoiling of the spring attached to its axis. A stop is provided on the cylinder, which comes in contact with the frame and limits the motion to one revolution in either direction. The inking roller consists of a hollow perforated cylinder covered with fiannel felt, or other suitable cylinder. This is filled with ink through an opening at one end; the ink passing through the perforations permeates the financi, and as the roller is rotated by the motion of the printing cylinder against which it bears, the type on the latter are kept continually supplied with ink. The indiarubber type may be readily detached from the printing cylinder and another substituted when required.—Patent completed.

2205 A. OLDHAM, Southport. Hanging pictures. Dated July 13, 1868.

An instrument is employed having at one end a swivel hook and at the other a screw hook, by which means the distance between the hooks may be made longer or shorter by turning the body of the instrument, so as to take in or let out the screw hook. By this means a picture frame may be raised or lowered for the purpose of adjustment with ease and certainty.—Patent abandoned.

2206 A. Munro and W. B. Adamson, Glasgow. Tools Dated July 13, 1868.

This relates to the application of chilled castiron as the material of which tools are made, such as are used for cutting, dressing, or finishing wood, metal, minerals, and fibrous substances, as well as for digging or cultivating land, including also hammers, picks, as well as tools of abrasion and penetration—Patent completed.

land, including also hammers, picks, as well as tools or abrasion and penetration—Patent completed.

2207 A. Munno and W. B. Adamson, Glasgow. Iron.
Dated July 13, 1868.

This consists as follows:—Chills of the shape required for the articles to be produced are provided, and molten crude or molten pig-iron is run into the chills. As soon as solidited, and for the purpose of making the material very hard and dense, the casting may be taken from the chill and cooled in water or otherwise, or it may be allowed to remain in the chills for a period, or the chills may be surrounded with, or cooled by, water. In place of forming the chill castings of absolutely crude iron, the iron before being cast may be partly refined by blowing atmospheric air into its mass, or by placing compounds of oxygen into the vessel or furnace wherein it is refined. It is to be clearly understood that the chills may be made of the finished shape of the articles to be produced, or they may different from the finished shape, and the castings made therein may be afterwards altered to the finished shape. The chilled castings are afterwards annealed or tempered, thus producing a material possessing many of the properties of wrought, forged, or malleable iron, but avoiding the coatly manufacture of iron now in use. The treatment hereinbefore set forth is especially applicable to



the construction of such articles as flyers for spinning machinery, buckles, stirrup irons, and light articles used in the arts and manufactures, which have hitherto been constructed of wrought iron, or forged of steel.—Patent completed

completed.

2208 G. B. MATHER, Wellingborough. Colour mills.
Dated July 13, 1868.

The matters are placed in a vessel, the lower portion of which opens into the smaller end of the internal cone, the axial line of which is in or about a horizontal position. Into this stationary conical surface is applied a corresponding conical surface, which is affixed to an exist which passes through a suitable opening provided for it in the side of the vessel, to be turned by a winch handle—Patent abandoned.

abandoned.

2209 G., G. W., and J. Betjeman, Pentonville. Book stides. Dated July 13, 1868.

To each of the slides a toothed rack is connected, which take into and receive motion from opposite sides of a toothed wheel mounted on a shaft or axis, to the outer end of which a knob is fixed. This shaft or axis is acted upon by a spring so as to keep the toothed wheel in gear with the racks, but when it is desired to allow the springs to act, the knob is pressed so as to throw the toothed wheel out of gear with the racks. A ratchet wheel and a catch or other suitable means are employed to retain the slides in any position to which they have been caused to travel.—Patent completed.

2210 W. R. Lake. Chancery-lane. Permonent serv. (A.

-Patent completed.

2210 W. R. LAKE, Chancery-lane. Permenent way. (A communication). Dated July 13, 1868.

This consists in the employment of ground plates of relied iron resting on a gravel bed, to which plates the rails are fastened. This can be done before leaving the rolling mill, or after the plates are in position. Cross pieces of iron rod are connected with the top rails by screw nuts and an ordinary "fish plate," where the rails join.—Patent completed.

join.—Patent completed.

2211 W. R. LAKE, Chancery-lane. Railway carriages. (A communication). Dated July 18, 1868.

The wheels of a railway carriage are connected in pairs by a hollow axle, through which passes a solid axle. The journals of this axle carry the weight. Secured to the carriage are two circular plates, which are firmly secured to the ends of the solid axle, and are each provided with a flange, which fits over a flange on the outer side of the wheels. The diameter of the flange of each plate is greater than that of the flange, to allow of considerable play between the two, the diameter of the solid axle being much less than that of the interior of the hollow axle, so that the former cannot come into contact with the latter. When the plate is in place upon the wheels, the flange touches another flange at one point only, to which point the weight of the load is transmitted from the axle through the plate, whereby a leverage is obtained equal to the distance from the centre of the solid axle to the point, and the amount of power required to move the load is thus correspondingly diminished.—Patent completed.

2212 J. C. LENER, Upper Thames-street. Railway

2212 J. C. LEVER, Upper Thames-street. Railway

2212 J. C. LEVER, Upper Thames-street. Railway sleepers. Dated July 14, 1863.

Bars of wood, iron, or other substance, as long as the width of the longitudinal sleeper, are employed, and are placed side by side. Sets of holes are bored through these bars in the direction of the length of the longitudinal sleeper, through which wires are placed so as to string the bars firmly together. At intervals, a bar is made long emough to be carried across from the sleeper of one line of rails to that of the other, so as to connect them; that is, at the intervals, one end of a long bar forms a part of the sleeper of one line of rails, and the other end forms a part of the sleeper of the other line of rails.—Patent abandoned.

2212 1 and 1 M TAYLOR Birkenhead. Promelling.

accanded.

2213 J. and J. M. TAYLOR, Birkenhead. Propelling.

Dated July 14, 1868.

For this purpose, portable paddle-wheels or screw propellers are so arranged as to be lowered in grooves fixed against the sides of the ship, and capable of being adjusted to any draught of water the ship may be taking.—Patent abandoned.

abandoned.

214 J. Baston, Shepherd's Bush. Bleaching. Dated July 14, 1868.

The material to be treated is first reduced by boiling and washing in the usual manner, as already well known and practiced by bleachers. When it has been sufficiently reduced, and the loose colouring matter removed, and the material brought to the state known as "boiled out," it is submitted, in a damp state, to the action of zone. It is then immersed in a chlorine bath of the ordinary character and strength, say from 1½deg. to 3deg. Twaddel, from about two to twelve hours (more or less). It is then removed and washed and soured in the usual manner, that is to say, it is washed and sterwards submitted to the action of an "antichlor," as well known and commonly practized. If the whole of the "sprit" is not "killed" or removed, or the desired colour or whiteness not obtained, it is again submitted, in a damp state, to the action of coone, and again washed and soured.—Patent completed.

2216 E. T. Kittor, Stratford. Fish size. Dated July 14, 2215 E. T. KITTOE, Stratford. Fish slice. Dated July 14,

1868.

The slice is formed in several parts, one of which is fixed to the handle, whilst the others are connected to the fixed portion of the slice by pin or other suitable joints. The movable parts are connected by links or connecting rods to a ring or slide capable of being moved to and fro along the handle of the slice.—Patent abandoned.

2216 J. BOOTH, Kingston-upon-Hull. Bone mill. Dated

July 14, 1868.

The grinding surface of this mill is composed of alter nate toothed rims and toothed grooves, combined with shellow cylinder or concave, having its internal concave surface formed with corresponding rims and grooves conversely arranged.—Patent abandoned.

versely arranged.—Patent abandoned.

2217 J. Cope and J. Bradbrook, Dalston. Bootbinding.
Dated July 14, 1868.

This relates to a machine for effecting the operation technically called "rounding," viz., forming the book round at the back, a process hitherto only accomplished by hand labour by a process of hammering. The machine consists of a movable vice, composed of two jaws, in which the books to be operated upon are securely held by their fore edges. The jaws are secured to a table. The table is provided on its under side with Vs, and is capable of being moved backwards and forwards on fixed horizontal guides of corresponding form. A reciprocating motion is communicated to their table by an adjustable crank, and on the back of a large bevel wheel, which is connected by a rod

to a similar pin on the under side of the table. The second part consists of an improved method of impressing the covers of books technically called "backing," and consists of a blocking press, having a rising block on which the book or cover to be operated upon is placed, a knuckle joint actuated by a cam through a connecting rod. When the knuckle joint is straightened, the bottom bed will be raised so as to give the impression. The third part of the invention relates to a machine for trimming the edges of books. This machine is provided with a revolving circular knife. The books are placed on the table, provided on its under side with V edges, which travel on rails, which may be of any convenient length, and have V grooves made therein. Any number of books may be placed on the table and secured by means of a screw clamp. When thus secured, they may be carried forward against the circular knife, which trims or cuts the edges. The books when trimmed are taken off on the other side of the cutter by an attendant, who then places on the table another lot of books, and when these latter are secured by the clamp, he reverses the action of the driving gear, and the table will be moved back, and the books thereby carried against the circular knife as before, and be out.—Patent completed. to a similar pin on the under side of the table. The s

2218 T. WOOD, Manchester. Railway signalling. Dated

back, and the books thereby carried against the dircular knife as before, and be out.—Patent completed.

2218 T. Wood, Manchester. Railway signalling. Dated July 11, 1868.

Each seat in the various compartments of a carriage is provided with a spring, which, when compressed, actuates a sliding bolt, key, or bar, placed underneath the body of the carriage, which is caused, when the spring is not compressed, to project outside the framework, in order to indicate the number of vacant seats inside the carriage. At each end of the carriage a glass door is provided, through which the guard of the train can enter; a mirror in the guard's box is so arranged that the entire length of the sompartment of the train is reflected therein, thereby giving the guard or passengers supervision throughout the train. Near the glass door a check string is provided, by means of which passengers may communicate direct with the guard. Another part of this invention relates to a novel arrangement of apparatus, whereby the passengers may communicate with the guard, in cases of great necestity, and the improvements consist in connecting tassels or handles projecting from the roof of the carriage, at short distances from each other, over the heads of the passengers, with a chain or rod, running over bowls inside the ventilator; these chains are connected with a lever and spring at each end of the carriage, which support a frame containing a half-moon shaped red glass, in connection with a lamp having a powerful reflector. When a passenger pulls down one of the handles or tassels, it withdraws the lever from under a red glass slide, allowing it to fall and expose a white glass; the same movement of the lever brings forward the light beneath a magnesium cap, which it ignites, and thus throws a brilliant white four bars, which embrace the ordinary draw bar; these bars and draw bars, projecting from the end of the carriage, are connected together by means of a plate, the opposite ends of the bars being connected to volute springs, situated bet

a supplementary book attached to the hook of the next carriage.—Patent completed.

2219 W. Shaw, Lancaster. Looms. Dated July 14, 1868. This consists, first, in the use of double-acting levers mounted on the loom frame, and reciprocating in opposite directions, which act in combination with a bowl mounted on a fixed stud on one of the levers, and which is caused to slide laterally by a lever motion, governed by the pattern chain, so as to bring the bowl in contact with one of two tappets of different diametes, which actuates the same, thereby giving movement to the double-acting levers and bars suspended therefrom, which are provided at their lower extremities with notches or teeth. During the contact of the bowl with either of the tappets, it is held or locked in position by means of a finger attached to the lever motion, which causes the lever bowl to slide, such finger being guided by a bar or pointer on either one of the the other side of it; the finger slides up and down, the locking bar or pointer being fixed to the frame of the loom. A second part consists in an improved construction and arrangement of the "box rod," the upper part of which is attached to the boxes as usual, but the lower part is provided with a series of teeth or notches, corresponding with the teeth or notches on the bottom, thus imparting the required rising and falling of the rods and the drop boxes connected therewith. A spring bolt entering one or the other of the series of notches formed on the box rod assists in retaining it at the different lifts, but giving may to its up-and-down motion when acted upon by the levers and rods.—Patent completed.

2220 W. B. FARWELL, New York. Heating ratheap carriages. Dated July 14, 1868.

2220 W. B. FARWELL, New York. Heating rathway arriages. Dated July 14, 1868.

This consists in fitting the connecting pipes between the arriages with a ball and socket joint, and fitting a pipe ree to slide in the connecting pipes to allow for the novements of the train. The pipes are supplied with team from the boiler to each carriage, a coil or series of ubes being placed under each seat for heating the compartment.—Patent completed.

partment.—Fatent completed.

2221 C. J. GALLOWAY and C. H. HOLT, Manchester.

Engines caives. Dated July 14. 1868.

These valves are formed with horns or projections which
are in width a little in excess of the space between them,
sufficient for the lap of the ports and the horns, and
consequently the spaces or ports of one piston valve are
opposite those of the other. The ports of one valve seat
are opposite the intermediate parts of the other valve seat.
Both piston valves are capable of rotation with their
shaft, which, whilst it is capable of sliding endwise, as
actuated by the eccentric, is also formed in part of a
hexagonal or other suitable figure, where it passes through

the boss of a tooth wheel, by which it is caused to rotate with that wheel, is taken into by the teeth of another wheel which the patentees prefer to be of half the diameter of the former; upon the axis of this second wheel, is applied a catch or star wheel adapted to be caught and successively moved for the rotation of the valves by a stud on a plate affixed to another axis, and this other axis also carries a mitre wheel, which, with another mitre wheel affixed to another axis receiving constant motion, are both simultaneously taken into by the teeth of an intermediate mitre wheel, which is capable of rotation on a rocking arm, actuated by the governor, so that whilst a constant rotary motion is being given to the valves the time in such rotation is varied by the action of the governor to regulate the cut-off—Patent completed.

2222 W. PATTON. Victoria-park. Breech-loaders. Dated

completed.

2222 W. Payton, Victoria-park. Breech-loaders. Dated July 14, 1868.

The barrel is formed to turn on an axis parallel or nearly so with the axis, and this axis, which is by preference affixed to the stock, is formed with a screw thread acting in a corresponding thread formed in the part carried by the barrel, so that in turning from the abutment portion, carried by the stock, it will travel outwards from such part of the stock to facilitate the clearance of the parts, also to facilitate the removal of spent cartridges.—Patent abandoned.

2223 J. THOMPSON and J. G. INGRAM, Hoxton. Feeding bottle caps. Dated July 14, 1868.

The cap is formed of india-rubber, moulded and vulcanized so that they will slip over and fit closely against the mouth of the bottle. In the centre of the top a hole is formed, through which is to be led the fiexible suction tube. A number of fine perforations, composed of three short straight slits radiating from a point, thus (Y), are formed through the cap, to allow of air entering: the bottle as fluid is withdrawn therefrom.—Patent completed.

2224 L. HANNART and N. A. AUBERTIN, Cheapside Door-picts. Dated July 14, 1868.

These improvements consist in taking a thin sheet of metal and cutting the letters entirely out by means of a rotating saw, or other cutting instrument, the plate being moved on a table in the direction of the shape of the letters, after which the plate so cut out is fixed to a plain piece of metal.—Patent abandoned.

plece of metal.—Patent abandoned.

2225 L. Hannart and N. A. Aubertin, Cheapside.

Type. Dated July 14, 1868.

This consists in making a long pattern in wood, or other
that several separate letters thereon, placed at
distances, as under, for the purposes hereafter stated.

The pattern is made in the form of a long trough, which,
when cast, is placed in a planing machine and the sides
planed true and to a gauge; this done, the casting is cut crossways by a circular saw, so as to separate the letters, which are
then ready to be set up by the printer, each piece being
as near as may be of the same size, so that when set up
they may present a flush surface.—Patent abandoned.

2226 H. LAWENGE, Durham. Mostag Awance berg.

they may present a flush surface.—Patent abandoned.

2226 H. LAWRENCE, Durham. Moving furnace bars.

Dated July 14, 1868.

The bars are caused to travel in one, two, or more endless chains or rows, and by alternately varying the speed
of each chain or row the sides of the bars are prevented
from being in continuous contact or maintaining the same
relative position one with the other during their movement from from to back of the furnace. Each bar or
alternate row of bars, as they pass over the several supporting rollers by which they are supported, are caused to
receive a slight lifting and lowering motion.—Patent
abandoned.

abandoned.

2227 A. TAYLOB, Birmingham. Spring studs. Dated May 15, 1868.

The studs are composed of a top and bottom part retained together by a concentric spring shank in the top part, passing down a concentric tube in the other part. When the two are put together, they will be so retained until relieved on the spring being pressed.—Patent abandoned.

doned.

2228 C. DE BERGUE and J. C. HADDAN, Westminster. Safes. Dated July 15, 1868.

The improvements comprised by the invention is the constructing strong rooms of thick iron or steel plates, so can be constructing strong rooms of thick iron or steel plates, so as can be constructed and relatively disposed as that with or without the interposition of wrought-iron flanged beams or girders, or of separate dowels or tongues between the plates, so as to afford a support and hold the plates together, without or with the additional hold or security which may be obtained from the simple bolting or keeping together of the parts. The patentees propose that the form of the safes be rectangular in either direction across the plan, circular, or elliptical. The several parts may be built up in their intended permanent position, and if desired within, or be afterwards surrounded by brickwork, masonry, or concrete, whereby the same may be rendered fireproof, and also additionally secure against the attempts of burglars.—Patent completed.

2229 W. HOLLINGWORTH and H. HALSTERD, Bradford.

2229 W. HOLLINGWORTH and H. HALSTRAD, Bradford.

9229 W. HOLLINGWORTH and H. HALSTRAD, Bradford. Supplying gas. Dated July 15, 1868.

A vessel is constructed to screw upon the end of the supply pipe of street lamps. It is set in a vertical position, and a pipe projects into the vessel so as to form an annular space or reservoir for holding mercury. A cap is formed with a cavity or projecting rim to enter the space and sink into the mercury in which the cap will float. The nipple or gas burner is fixed upon the top of the cap.—Patent abandoned.

2230 R. COUTY and J. RICHARD, Paris. Teaching singing. Dated July 15, 1868.

Dated July 15, 1868.

This invention is to facilitate vocal instruction at schools, and render the task less irksome by lessening the fatigue of the instructor, whose voice, after prolonged exercise, is not so likely to be in tune, and therefore unable to give the exact pith of the note desired to be sung it consists of an apparatus or rectangular box divided into three compartments. On the outer surface of the first of these a gamut or scale of do, re, mi, fa, soi, la, si, do, is printed; in the second, the notes or reeds, similar to those of an harmonium or accordion, are arranged; and the third constitutes the air chamber, which is put in communication with a bellows, by means of a fiexible tube.—Patent completed.

2231 R. CHAMBERLAIN, Eaton-source. Marticles.

2231 R. CHAMBERLAIN, Eaton-square. Morticing chies.
(A communication). Dated July 15, 1868.
The tool is formed with two side lips, bevelled at an angle of or about 45deg., with the face of the chiesl; the lips are devetalled inwards and upwards. The side fiaps,



which are also bevelled sufficiently to clear the sides of the mortice, project about one-eighth of an inch below the edge of the main bevel.—Patent abandoned.

edge of the main bevel.—Patent abandoned.

2232 J. H. JOHNSON, Lincoln's Inn-fields. Lamps. (A communication). Dated July 15, 1868.

This consists in making the whole of the body, stand, and burner, or wick holder of glass or any ceramic material in lieu of metal. Also in employing a cotton or other wick as an absorbent of the volatile oil introduced into the body, so that no free liquid will be contained therein, the vapour aloue emitted from the top of the wick being ignited, and hence liability to accidents from spilling the oil is greatly reduced.—Patent completed.

2233 J. BONNALL, Grantham. Seed drills. Dated July 15,

Springs are employed for chain drills to carry or act upon one set of the pulleys around which the chains which supply the corn, seed, or manure to the guide boxes pass. Also in the employment of a chain transversely of the machine for feeding the seed to the guide boxes, and in order that one or more of the guide boxes may be put out of action when desired, a series of slides are employed to shut off the communication between the seed box and the chain.—Patent abandoned.

chain.—Patent abandoned.

2234 T. Cook, Old Kent-road. Oil presses. Dated July 15, 1868.

This consists of a deep but narrow box with steamers, the entire width and depth of which is only the width of the cake after compression. To the bottom of the box a sliding or false bottom is arranged, as to be easily removed after the seed or other oil-yielding substance has been sufficiently compressed, to allow the compressed residuary matters or cake, to be forced by steam power out of the box into a receptacle below.—Patent abandoned. out of doned.

out of the box into a receptacle below.—Patent abandoned.

2235 W. TURNER, Blackburn. Pump buckets. Dated July 15, 1868.

This consists in a novel construction of the bucket and packing and in the use of india-rubber for keeping the packing at a uniform tightness, and preventing excessive friction. The packing consists of an outer metallic ring, having an internal flange supported by the botton plate of the body of the bucket, the ring and flange being at one part cut entirely through or split vertically, and the flange at several parts, as far as the inner surface of the ring. Upon this flange, between the ring and the body of the bucket, one or more rings of india-rubber are placed, upon which a flat metallic ring bears, which acts as a washer, and on the top plate of the bucket there are screws which, when turned in one direction, act on the flat ring, and press upon the india-rubber, which expands and presses the outer metallic ring against the cylinder or barrel, and maintains a liquid-tight packing without undue friction. The pressure of the screw is exerted on the india-rubber after the bucket is placed in the barrel or cylinder, and if the pressure is properly adjusted at first, the elasticity of the india-rubber causes the outer metallic ring to follow up the wear and keep the packing tight without frequent turning of the screws.—Patent completed.

2236 J. I. MAGFARLANE, Upper Holloway. Shirt fronts.

2236 J. L. MAGRARLANE, Upper Holloway. Shirt fronts.
Dated July 16, 1868.
This consists in introducing in the centre of the front, either by weaving or by other means, a representation of a cravat or tie.—Patent abandoned.

a cravat or us.—Fatent abandoned.

2237 R. WHISTON, Wolverhampton. Sash fastener.

Dated July 16, 1868.

This fastener is so constructed that when the arm is pressed into its position for holding the sashes together, it shall firmly lock itself underneath and against the plate on one side, and in a notch in the catch plate on the opposite side.—Patent abandoned.

site side.—Patent abandoned.

2238 H. W. RIPLEY and T. SHACKLETON, Bradford Winding threads. Dated July 16, 1868.

This invention consists in winding printed or other warps or threads of cotton, or other fibrous substances, in single or double ends from a beam or large bobbin on to or upon a series of small bobbins, spools, or tubes. These may be driven by frictional contact with pulleys or other means, and traverse motion may be given to a series of guide eyes for guiding the ends to the bobbins in regular order.—Patent completed.

2239 R. Berson, Edgware-road. Boiler. Dated July 16.

1868.
This consists of a boiler of cylindrical form so constructed that the heat from charcoal can be made to impling upon a large surface and heat the contents quickly. Also in a rotary bellows worked by a weight and cord.—Patent abandoned.

2240 T. F. G. WINTOUR, Kentish Town. Ventilating. Dated July 16, 1868.

Dated July 16, 1868.

The apparatus consists principally of a rectangular box or frame fitted with a wire gauze screen and a sliding glass shutter. The screen is folded backwards and forwards horizontally in a zig-zag or serpentine form, and the glass shutter slides vertically in contact with the inner edges of these horizontal folds, which are all in the same vertical line, so that as the sliding shutter is lowered it opens up each fold successively.—Patent abandoned.

2241 D. RUSSELL, Camberwell. Masting ships. Dated July 16, 1868.

The masts are so constructed that they can be lowered

when desired, as, for instance, when steaming against the wind. For this purpose, in lieu of the ordinary lower mast, a pair of shear legs, hollow or solid, is employed, the lower ends of the shears being respectively secured at the port and starboard sides of the vessel, where their feet are bolted or hinged in troughs or shoes.—Patent abandoned.

2242 J. C. RAMSDEN, Bradford. Looms. Dated July 16,

1868.
This relates to a peculiar and novel method of forming the shed required in weaving that class of goods in which spots or figures of either a different colour or material to the ground weft are inserted, whereby a figure containing plain cloth can be woven within the outlines without losing a ground pick, and this is accomplished somewhat as follows:—Both healds or heddles are employed, and a common jacquard apparatus so arranged that when the jacquard is in operation the warp threads are free to work up and down in the healds without any strain being placed thereon, and when the healds are in operation the warp threads are free to move up and down in the harness without any strain.—Patent abandoned.

2243 W. R. LAKE, Chancery-lane. Straw cutter. (A communication). Dated July 16, 1888.
This consists in the peculiar combination of a cutting blade or knife with two handles, one of which is formed or fixed at the extremity of a rod or stem, which carries the knife, while the other handle projects at right angles from the said rod.—Patent completed.

from the said rod.—Patent completed.

2244 W. R. Lake, Chancery-lane. Harness links. (A communication). Dated July 16, 1868.

This consists partly in the peculiar mode of constructing links or rings with a split or opening, which allows such links or rings to be conveniently connected or disconnected with other links or couplings, but will not allow them to become accidentally detached or removed from the same. The invention also consists partly in the combination of a split or divided link or ring, with a tongue or catch to form a buckle for securing the link upon the reins or other parts of harness, or to straps and bands for other purposes. The links or couplings are formed of wire, which is bent and twisted into the required shape. The two ends of the wire are flattened and lapped over each other, the split or division being between them. The split or division is widened at the exterior of the link, to facilitate the insertion therein of any article to which the link is to be united.—Patent completed.

2245 S. DAVIS, Strand. Animal clipper. Dated July 16,

2245 S. DAVIS, Strand. Animal clipper. Dated July 16,

1868.
A series of comb teeth are formed upon the front end of a plate or frame, which teeth serve to collect the hair or wool to be cut between them, the edges of the teeth acting as blades, against which the hair is cut, when the movable cutter (mounted upon a centre at the back part of the comb blade or frame) is moved across the surface of the comb by the operator.—Patent abandoned.

### APPLICATIONS FOR LETTERS PATENT.

Dated January 19, 1869.

167 S. G. Archibald, Edinburgh. Improved machinery for cleaning boots and shoes, knives, forks, spoons, and other articles, and for sharpening knives and other cutting

other articles, and for sharpening knives and other cutting instruments.

163 M. Burke, Liverpool. Improvements in the construction of ships' skylights.

169 G. Lowry, Bury-street Foundry, Salford, Lancashire. Improvements in the construction of hackling machines.

170 W. and J. Pain, Charles-street, Stepney, Middlesex. An improved floor dog or flooring cramp.

171 H. W. Hammond, Princess-street, Manchester. Improvements in the mode of, and in apparatus or mechanism for, driving piles. (A communication).

172 J. Armstrong, Brinsworth Iron Works, Masbro', near Rotherham, Yorkshire. Improvements in crossings and switch apparatus to be used with the permanent way of railways, part of which improvements is applicable to other purposes.

other purposes. other purposes. 173 C. Baunscheidt, Endenich, near Bonn, Prussia. A new or improved instrument to be used in the treatment

A new or improved instrument to be used in the treatment of rheumatism and other diseases.

174 N. D. Spartali, Liverpool. An improved mode of, and apparatus for, propelling vessels.

175 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in wheels for railway carriages, locomotives, and other vehicles. (A communication).

176 C. E. Brooman, Fleet-street, City, patent agent, Improvements in breech-loading guns. (A communication).

Improvements in breech-loading guns. (A communication).

Dated January 20, 1869.

177 G. A. Crow, Newcastle-on-Tyne. Improvements in radial and other drilling machines.

178 J. Siddeley and F. N. Mackay, Liverpool. Improvements in means and apparatus for cooling, refrigerating, and ice making.

179 F. A. Paget, Seymour Chambers, York-buildings, Adelphi, W.O. Improvements in the construction and arrangement of steam bollers, and in their furnaces, grates, and flues. (A communication).

180 W. Gillett and C. Bland, Croylon, Surrey. Improvements in mechanism for bell and clock chimes, such improvements being also applicable to keyed automatic or other musical instruments.

181 J. Edwards, Richmond-road, Hackney, Middlesex. Improvements in communication between passengers and guards of railway trains, and signalling on railways.

182 E. Burton, Upper Clapton, Middlesex. A new or improved machine for distributing sand or other matters in public thoroughfares.

183 E. Barcroft, Rawtenstall, Lancashire. Improvements in the construction of cocks, taps, or valves for controlling the flow of water or other liquids.

184 P. C. Evans, Brimscombe Mills, Gloucestershire, and H. J. H. Kling, Glasgow. Improvements in apparatus for feeding wool or other fibrous materials to carding or other machines.

185 M. J. Matthews, Glasgow. Improvements in harmoniums.

moniums.

monlums.

186 H. A. Bonneville, Sackville-street, Piccadilly. Improvements in the manufacture of illuminating gas and of sponge, by the action of hydrocarbon liquids or fluids on metallic ores, and in the furnaces for melting said sponge and other metals. (A communication).

187 H. A. Bonneville, Sackville-street, Piccadilly. Improvements in metallic action frames for pianofortes. (A communication).

188 F. Lipscombe, Strand. Improvements in purifying and storing water, and in the apparatus employed thervin.

189 C. de Bergue and C. Faure, Strand. Improvements in locomotives and other raliway carriages.

190 D. Spooner, West Abbey-road, Kilburn, Middlesex. An improvement in the construction of mills for cleaning rice or other grain.

Dated January 21, 1869.

191 J. W. Wilson, Barnsley, Yorkshire. Improvements in steam boilers.

192 J. C. L. Camel, Rue St. Helene, Lyons, France. An improved surgical truss or bandago.

193 D. Rivenc, Geneva, Switzerland. Improvements in apparatus for mending and cutting or shaping millstones.

194 A. M. Clark, Chancery-lane. Improvements in clasps or fastenings for scarfs and other articles of dress. (A communication).

195 C. J. Clubb, Endsleigh-street, Tavistock-square, Middlesex. Improvements in drills and apparatus for boring holes in coal, hard ground, slate, and minerals. 186 H. A. Bonneville, Sackville-street, Piccadilly. Im

196 T.C. Lewis, Shepherd's-lane, Brixton, Surrey. The improvement of steam engines.
197 C. G. Gumpel, Leicester-square, Middlesex. Improvements applicable to keyhole plates and escutcheons.
198 F. Walton, Staines, Middlesex. Improvements is the manufacture of artificial marble.
199 W. R. Lake, Southampton-buildir lane. An improved apparatus for sheari akins. (A communication).

Dated January 22, 1869.
200 B. Baxenden and J. Heald, Chorley, Lancashire, Improvements in looms for weaving.
201 A. B. Cunningham, Royal Military Academy, Woolwich. Improvements in apparatus for throwing horses and other cattle for veterinary purposes.
202 B. Craig, Branthwaite, Cumberland. Improvements in apparatus or machinery for communicating and signaling between passengers, guards, and drivers of railway trains.

ling between passengers, guards, and drivers of railway trains.

203 M. Tildesley, Willenhall, Staffordshire. An improvement or improvements in the manufacture of the annealing cans used in annealing sheet iron.

204 J. Wilkins, Nottingham. Improvements in the manufacture of looped and knitted fabrics.

205 J. Speight, J. E. Burton, and E. Brooke, Bradford, Yorkshire. Improvements in machinery or apparatus for spinning, twisting, or doubling and roving wool or other fibrous substances.

206 A. Maw, Benthall Works, near Broseley, Salop. Improvements in the construction of moulds for moulding china, earthenware, or pottery.

207 F. R. Ensor, Park, Nottingham. Improvements in the manufacture of the fabric known as Ensor net for lace.

lace.

208 T. Cook, Old Kent-road, Surrey, and J. Watson, Victoria Chambers, Westminster. Improvements in the mode of, and apparatus for, producing and applying motive power, also applicable for measuring the flow of gas and other fluids.

209 J. W. and J. W. Horsfield, Vulcan Iron Works, Dewsbury, Yorkshire. Improvements in steam boilers.

210 W. E. Gedge, Wellington-street, Strand. Improvements in machines for cutting into slate in quarries, applicable also to machines for cutting in coal pits, mines, and stone quarries. (A communication).

ments in machines for cutting into slate in quarries, applicable also to machines for cutting in coal pits, mimes, and stone quarries. (A communication).

211 W. Dennis, Aldermanbury, City. Improvements in letter boxes, letter pillars, and such like depositories.

212 W. Burgess, Newgate-street, City. Improvements in mineing machines.

213 J. Beattie, Surbiton, Surrey. Improvements in buffing apparatus for railway carriages.

Dated January 22, 1869.

214 J. Millward, Birmingham. Improvements in machines for quarrying and aswing stone or minerals. (A communication).

215 J. Ortton, Courland-grove, Wandsworth-road, Surrey. Improvements in graduating the admission of steam to the cylinders of locomotive and other ateam engines by means of the reversing and regulator gearing. (A communication).

216 E. Simons, Sheffield. Improved means of communicating between passengers, guard, and engine driver upon railway trains.

217 W. Huggins, Halstead, Essex, and H. Horsnaill, Bulford Mills, near Witham, Essex. Improvements in dressing millstones, and in apparatus to be used therefor. 218 L. J. Crossley and R. Hansom, Halifax, Yorkshire. Improvements in the means used in steaming printed yarns.

219 H. H. Murdoch, Staple lun. Improvements in the

218 L. J. Crossley and R. Hansom, Halifax, Yorkshire, Improvements in the means used in steaming printed yarns.
219 H. H. Murdoch, Staple lun. Improvements in the smelting of copper, and in apparatus to be used therein, (A communication).
220 B. Mountain, T. Richmond, and G. Duffield, Leeds, Improved appliances to be used in the manufacture of boots and shoes.
221 J. Dinsdale, Skipton, Yorkshire. Improvements in spinning and twisting machinery.
Dated January 25, 1869
222 J. M. Merrick, jun., Massachusetts, U.S.A. A composition or compound, and a mode or process of treating and moulding the same (such compound being for various useful purposes in the arts or for the manufacture of various useful purposes in the arts or for the manufacture of various useful or ornamental articles).
223 W. M. Welling, New York, U.S.A. Improvements in compositions resembling ivory.
224 C. Toucherleux, Rue Ste. Appoline, Parls. Improvements in hinges of ear-rings, applicable also to certain other articles of jewellery.
225 C. B. Parkinson, A. and J. Metcalfe, and W. H. Heald, Preston, Lancashire. Improvements in the construction of mules for spinning.
226 R. G. Lowndes, Auldhousefeld and Crofthead, Renfrewshire, and M. M. Callum, Barrhead, Renfrewshire. Improvements in machinery or apparatus to be employed for finishing textile or other fabrics.
227 C. E. Brooman, Fleet-street, City, patent agent. Improvements in the construction of cocks or valves. (A communication).

Improvements in the construction of cocks or valves. (A communication).
228 W. E. Newton, Chancery-lane. Improvements in machinery for stamping and forming articles of sheet metal. (A communication).
229 J. Carr, Manchester. Improvements in the production of tapes or ladders for venetian blinds.
230 A. V. Newton, Chancery-lane. An improvement in fermenting substances and germinating grain and seeds. (A communication).
231 E. Hartley, Oldham, Lancashire. Improvements in looms for weaving.
232 H. D. Bowyer, Ripley, Woking, Surrey. Improvements in the manufacture of wheaten flour.
233 R. J. Green, Birmingham. Improvements in collar studs or buttons, shirt studs, sleeve links, and other like articles.

articles.
234 J. and S. Roberts, West Bromwich, Staffordshire. Improvements in the manufacture of moulds for casting, and in machinery or apparatus to be employed in the said

and in machinery or apparatus to be employed in the said manufacture.

235 H. W. and R. Lafferty, Gloucester, Camden, New Jersey, U.S.A. New and useful improvements in centri-fugal machines for draining sugars and other substances, and in the manner of their support, and the means of communicating motion thereto.

NOTICES OF INTENTION TO PROCEED WITH
PATENTS.
From the "London Gazette," January 26, 1869.
2325 H. J. Turnbull. Preserving the bottoms of iron



2826 J. Tenwick. Constructing annealing ovens. 2836 J. H. Schucht. Constructing pianofortes. 2840 R. Martin. Apparatus for cleaning boots. 2843 E. Heusser. Looks for travelling bags. 2844 W. Durham. Protecting from corrosion wire webs

and strainer plates.
2846 C. Havard and M. X. Harmony. Means for pre-

2846 C. Havard and serving meat. 2850 G. R. Samson. Construction of pianofortes. 2860 T. Beards. Steam plough. 2861 J. Davey. Ploughs. 2863 W. E. Newton. Apparatus for raising water. communication).

2865 W. R. Lake. Explosive compounds. (A commu-

ication). 2866 H. Wilson. Engines worked by hydraulic fluid. 2867 G. H. Barth. Apparatus for supplying gases for

medicinal purposes.
2868 T. and J. Jones, J. Brandwood, and J. Wren.

Furnaces.
2870 J. H. Johnson. Mode of advertising. (A commu-2873 J. Head. Constructing wire fences. (A communi-

2874 C. H. Hudson. Washing apparatus. 2875 E. T. Hughes. Wringing machines. (A communi-

ation).
2876 W. Cross. Carriage door stops.
2879 E. Templehoff. Potato-planting machine.
2882 J. Smith and J. Dewdney. Steam bollers.
2883 W. H. Hughan. Treatment of sewage.
2884 G. Bernhardt. Machines for spinning fibrous

materials.
2888 F. Dyer. Apparatus for supplying bath rooms

2888 F. Dyer. Appearance
with hot water.
2891 L. Desens. Miners' safety lamps.
2896 H. Foster. Bruising leather.
2899 W. C. Woodcock. Bakers' ovens.
2901 N. Stevenson. Working ornamental fountains.
2903 J. Lorkin. Coffee-pots.
2907 C. Vero. Manufacture of hats.
2915 W. Leatham. Apparatus for preventing accidents

2907 C. Vero. Manufacture of hats.
2915 W. Leatham. Apparatus for preventing accidents to steam boilers.
2920 J. Macintosh and W. Boggett. Application of elastic bands to boots and shoes.
2928 W. Thomas. Circular saws.
2929 A. M.N. and M. A. Weir. Pneumatic apparatus.
2931 C. Hengst, H. Watson, J. B. Muschamp, and N. Wilson. Manufacture of carburretted hydrogen.
2955 J. Sutcliffe. Warping mills and hecks.
2962 G. F. Morant. Artificial fuel.
2963 V. Gallet. Manufacture of cast steel.
3018 F. A. Calvert. Machinery for carding cotton.
3220 H. Clifton. Butter churns.
3609 W. R. Lake. Paddle-wheels for steam ships. (A communication).
3628 A. N. Burton. Metallic eyelet.
3694 M. P. W. Boulton and J. Imray. Botary propellers.
3760 W. Gray and T. Biggin. Manufacture of spanners and wrenchers.
3835 T. Warwick and A. Boyle. Machinery for the manufacture and testing of the ribs of umbrellas.
3933 R. Samuelson. Manufacture of iron and steel.
3939 T. Gibson. Buffers to be used on railways.
27 E. W. and J. Voce. Construction of rotary fans.
37 A. W. C. Williams, Lawn mowers. (A communication).

76 J. Knowles. Weaving counterpanes.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

# LIST OF SEALED PATENTS. Sealed January 22, 1869. 2384 J. Jeffreys 2387 A. Watkins 2389 S. C. Lister 2390 T. H. Rob B. C. Cross

Sealed Januar

2310 J. Bowron and G.
Lunge
2312 E. T. Hughes
2325 F. H. Danchell
2338 J. Greenhalgh
2349 J. A. Hogg
2350 G. R. V. Loughton
and E. B. Jackson
2351 J. Higgin
2365 G. Hodgson, H. Bottomley, and E. Cockroft

2383 S. C. Lister

Sealed January 26, 1869. ry 26, 1869.

2449 F. W. Kitson and P. Chalas

2466 A. V. Newton

2498 D. Fruwirth and A. Hawkins

2549 J., J., and W. Fletcher

2588 F. Braby

2601 A. V. Newton

2621 W. R. Lake

2649 S. Morris

Roberts and

B. C. Cross 2396 T. Prosser 2406 P. N. J. Macabies 2407 B. Sharpe 2426 C. Geoghegan 2428 J. Scott 2430 S. Plimsoll 2463 A. M. Clark

2463 A. M. Clark 3089 T. Heacock

2363 T. Hydes and J. Ben-

2363 T. Hydes and J. Bennett
2364 J. Webster
2365 J. Bullough
2367 C. A. La Mont
2368 W. R. Lake
2369 W. R. Lake
2369 S. M. Martin and S.
A. Varley
2373 F. Winser
2374 J. Mabson
2376 W. B. Lake
2381 J. Radeliffe
2388 G. Woodhouse and
J. G. M'Minnies
2398 J. and H. A. Gwynne
2429 H. O. Robinson
2438 T. Ward

2621 W. R. Lake 2649 S. Morris 2763 A. R. Stocker and J. A. Edgley 2769 J. Stewart and J. Nicholson 3338 L. Berenger 3610 W. R. Lake 3723 W. R. Lake

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

203 T. Rowatt 227 E. Hopkins 229 J. W. Evans 238 G. Hinchliffe 241 J. Jones 243 W. Clark 257 F. L. Boux

262 R. A. Brooman 303 R. Clayton, J. Raper, J. Goulding, and W. Howarth 321 A. Murray 425 B. W. Farey

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID. 197 D. Edleston and H. 191 J. Alison Gledbill 239 W. E. Newton

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3566	32	51	59	73	82	90	100
3604	39	52	60	74	83	91	101
3716	45	53	61	76	84	92	102
3724	45	54	62	77	85	93	103
3736	47	55	66	78	86	95	104
3758	48	56	68	79	87	96	105
3815	49	57	70	80	88	97	106
3978							1

# LIST OF SPECIFICATIONS PUBLISHED

For the week ending January 23, 1869.

No.	F	r.	Vo	8	r.	4	0.	F	r.	No	١.	P	r	Ņ	0	F	r.	No.	P	Pr.
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1287	0	4	1812	1)	8	18	95	0	8	198	38	2	4	L	96	)	4	1980	t	0
1699	1	0	181-	1)	6	18	396	0	8	194	12	0	8	1	96:	)	6	1985	0	6
1736	0	8	1826	I	4	18	397	0	10	194	18	0	4	t	96	)	4	1986	0	8
1740	1	8	1831	0	8	119	900	0	8	19	50	0	4	t	969	)	4	1987	0	4
1748	1	2	1850	0	10	15	001	0	8	198	51	0	4	1	976	)	4	1992	0	4
1748	0	10	1856	1	4	15	903	0	10	19	52	0	4	ı	972	)	4	1994	0	4
1752	0	6	1867	1 1	4	15	904	1	4	19	54	0	4	t	974	0	10	1996	0	4
1767	1	0	1879	2 0	10	15	913	0	8	19.	58	0	4	h	975	0	4	1997	0	4
1771	3	0	1888	3 0	10	15	927	0	10	19.	59	0	10	ı	977	0	4	1999	0	4
1781	1	10	1889	0	10	15	928	0	8	19	60	0	4	1	978	0	4	2003	0	4
1803	0	8	1890	0 0	10	1	937	0	10	19	63	0	4	1	979	1	10			

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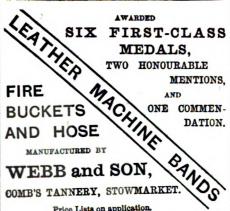
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L. GRANDEAU, Socretary of the Jury.

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THE

# MECHANICS' MAGAZINE.

LONDON: FRIDAY, FEBRUARY 5, 1869.

ATMOSPHERIC TRAIN SIGNALLING BOUT nine months since we noticed a A BOUT nine munus since " yestem of very simple and efficient system of principle. telegraphy upon the atmospheric principle, which had been perfected by Messrs Wier. This system will have become familiar to many of our readers from its adaptation on board the "Bellerophon," the ships which laid the Malta and Alexandria telegraph cable, and other vessels. It is, however, its application in another direction with which we now have to deal—namely, as a means of communication between passengers and guards in railway trains. At the present time, the railway companies are on the alert to satisfy he requirements of the recent Act of Parliament, which directs the adoption of a means of communication in trains. With this view. a trial of Messrs. Wier's system was made on Saturday last on the London and South Western Railway. The trial was conducted by Sir Samuel Canning, and Colonel Yolland represented the Board of Trade. There were also present Mr. Beattie, the locomotive engineer, and Mr. Williams, the superintendent of the South-Western Railway, Mr. Seymour Clarke, of the Great Northern, Mr. Martley, of the London, Chatham, and Dover, Mr. Ray, of the London and Brighton, and other gentlemen representing various railways.

Messrs. Wier's system of atmospheric telegraph consists mainly of elastic metallic airtight vessels, and which are far superior to those of india-rubber that have been introduced in other systems. These vessels are corrugated, and are similar to those used in aneroid barometers. Three of these chambers, each 7in. in diameter and 1in. in depth, are fixed over each carriage, communication being effected from one carriage to the other, and so on, to the front and rear guards' vans, by tubing of small diameter. Soft metal tubing of 1-8th inch internal diameter is used on the carriages, the unions being of india-rubber tubing, and the junctions or couplings between the carriages of brass. These couplings are very ingenious. A couple of thumbscrews, on being turned round, re-lease the coupling, and at the same time shut off communication with the atmosphere. In each of the guards' vans is an air chamber of smaller dimensions than those on the carriages, being only 3in. in diameter, and  $\frac{1}{4}$ in. in depth. It therefore follows that on compressing any of the larger chambers the smaller one will be distended, communication of course being perfect. The distension of the chamber in the guard's van causes it to act upon a train of clockwork, which strikes an alarum and gives the necessary intimation to the guard that he is required by a pasenger. The guard then signals to the driver at least such was the arrangement on Saturday-although the system allows of direct communication with the driver, if it is found The signal is made from the carriage by means of a bell-pull connected with a lever on the roof, which compresses the air chambers, and at the same time releases a semaphore arm at the end of the carriage, which at once indicates the point from whence the signal was given. The compartment from which the signal was made is easily known by the bell-pull remaining down until the guard releases the lever and restores the semaphore to its normal position.

A train of twenty-five carriages, measuring bout 600ft. in length, and fitted with this imple apparatus, made a run to Woking and

back, upon the occasion in question, with the most successful results. Signals were given from a carriage near the centre of the train, at irregular intervals of time, and were received on the footplate of the engine practically instantaneously, although they were communicated through the guard. This was ascertained by Colonel Yolland and the gentlemen who signalled having acceptance in the control of the con tleman who signalled having compared time at starting and their notes on stopping, the Colonel having travelled on the footplate. The train was stopped at Kingston on the way down, and shunted on to a siding, where a carriage was taken out of the train in order to show the facility with which such an operation could be conducted. The connection is so constructed, as already explained, that it is severed and reunited with equal facility, so that no loss of time can occur in this respect, either in making up a train or There was also a modificataking it apart. tion of the system shown, by which one guard was enabled to talk either with another guard or with the driver. This result depends on the number of thrusts given to the air-chamber in one guard's van, and which, acting on the chamber in the other van, caused a hammer to strike a bell. Thus, by forming an alphabetical code, messages might be transmitted with ease and certainty. There are, of course, various other points of detail which occur in practice in the working of trains, and for which provision could readily be made under Messrs. Wier's system. We have only described its application upon an experimental train, in which there was no necessity for considering or providing against the exigencies of regular train service. cient, however, was done to impress all present with the simplicity and the practical character of the system, and to show that the details could be readily arranged to suit the varying requirements of different railways. As the adoption of any system by railway companies will doubtless be governed first by its efficiency and next by its cost, we think it right here to mention that the trials of Saturday fully satisfied us that no objection can be raised to the Wier system on the first point, whilst its extreme simplicity, and the absence of any parts susceptible of wear and tear, indicate economy both in first cost and in maintenance. This can be readily proved by an examination of the system at the offices of the patentees, 10, Philpot-lane, Fenchurch-street, City. We may add that Fenchurch-street, City. We may add that the "Great Eastern" is now being fitted with this atmospheric telegraph, preparatory to laying the French cable. For such pur-poses, Sir Samuel Canning stated he has found it invaluable.

## THE BRITISH INDIAN SUBMARINE TELEGRAPH COMPANY.

T is but a few days since we referred to the probable telegraphic extensions of the year, and, amongst those extensions, to a new link in the chain of communication between England and our East Indian possessions. We certainly looked forward to it as being one of the early projects of the year, but did not expect the advent of such a scheme so soon after our remarks. The past week has seen the prospectus of the British Indian Submarine Telegraph Company, and before these remarks are before our readers, the share application list will have closed.

When the Anglo-Mediterranean Telegraph Company was formed for laying a submarine cable direct from Malta to Alexandria, it was in contemplation, on the success of that line, to extend the telegraphic system to Aden and The successful submersion during Bombay. the past year of the Mediterranean cable, and the amount of traffic carried through it, has justified the present line in being brought out "in connection with the Anglo-Mediterranean telegraph."

India has not been without its lesson. The original attempt of laying a submarine cable to India proved a costly flasco. Since then, we have learnt experience. It is idle here to rake up the old story of the Red Sea cable; it may be summed up in a few words,—a bad So much route and an unsuitable cable. agitation had been got up at different times amongst those specially engaged in Indian business, that, at the last, a Parliamentary enquiry sat in 1866 to investigate the postal and telegraphic service to India. The committee, over which Mr. Craufurd presided as chairman, were decidedly in favour of a telegraphic route via Suez and Aden to Bombay. A scheme for the furtherance of this object came out in 1867, but it is not to be wondered at that, as a result of the money panic, there was a general want of confidence in everything monetary, and the scheme died. Since that time, the wonderful success of the Atlantic cable revived confidence in deep sea telegraphy, and the question was again brought forward. The further success of deep sea telegraphy, in the laying of the Malta-Alexandria direct submarine cable, has made the extension of telegraphy by submarine cable to India a necessity. Having got so far as Egypt, it would not do to stop there.

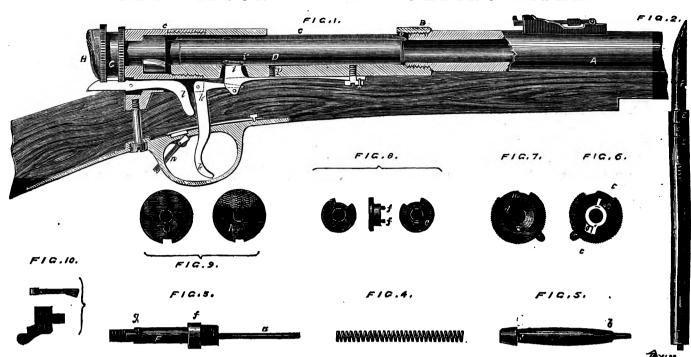
By the assistance of the Government, careful soundings have been taken, so that an accurate knowledge is now obtained of the bottom of the Red Sea and the Indian Ocean; and lately the "Admiralty has recently obtained an excellent line of soundings from Aden to Bombay, indicating low temperature, and that the nature of the sea bottom and the depths of water are similar to those of the present Atlantic submarine cable route, and the soundings in the Red Sea previously taken furnish a safe and satisfactory line." The prospectus informs us that the company has been incorporated for the purpose of constructing a submarine telegraph line between Suez, Aden, and Bombay, so as to complete a direct and reliable line of telegraphic communication between Europe and India, and with a view to future extension to China and Australia." Our present system of communication with Egypt is as follows:—Telegrams leaving England are usually forwarded by the submarine cable to France — through France they proceed to Susa, on the Franco-Italian frontier, from which point they are transmitted over a line belonging to the Anglo-Mediterranean Company to Modica in Sicily, and over the Medi-terranean Extension Company's cable to Malta, from there over the Anglo-Mediterranean Company's cable to Alexandria, and then again over a leased English line to So, in fact, with the exception of the French portion, the route is entirely English. We naturally have some pride in our English telegraphists, and it is always with additional confidence we send messages by means of English operators. The route augurs well both for speed and, what is really more necessary, accuracy; this, it may be assumed, there is a greater chance of obtaining when the message passes all the way through the hands of an operator who speaks a similar language.

The British Indian Company have entered into a provisional contract with the Telegraph Construction and Maintenance Company for "constructing a thoroughly efficient cable— 3,600 nautical miles in length—and for laying the same." The contract includes stations, station requisites, and instruments for working the traffic, and the contractors are to hand over the steam-ship "Chiltern," with all her "cable fittings, and machinery, as a maintenance ship." The capacity of the cable is guaranteed by the contractors at not less than twelve words per minute. The capital of the company is £1,200,000, and the contract price is £1,000,000, of which sum £540,000 is to be paid in cash, and £460,000 nean telegraph."

in fully paid up shares. Of this latter
The history of our submarine lines to amount, £150,000 is reserved, and not to be

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# THE WILSON BREECH-LOADING RIFLE.



paid over, as to £50,000, until the cable is successfully laid between Suez and Aden, and as to the remaining £100,000 until the line has been completed between Aden and Bombay. Of the remaining shares, £380,000 have been taken, leaving £170,000 for public allotment; to the holders of these several amounts, a number of free shares (£137,500) are to be allotted as profit shares, the balance of the capital being put down to expenses, &c. With a company brought out under such terms, and with so little share capital to be taken, it is difficult to imagine anything but success; and by this time we may suppose the whole thing completed. According to the contract, the work is to be completed by April, 1870, and from what we know of the capabilities of the contractors, the time does not seem long.

Although the cable is of so great a length,

it will not require the large size of core hitherto generally adopted in a long submarine cable. The use of Thomson's reflecting galvanometer as a receiving instrument is a new era in submarine telegraphy, and from the experience gained from working with that invaluable instrument on the Atlantic and Malta and Alexandria cables, it is found that a smaller quantity of copper and guttapercha are required than for the ordinary working by the Morse instrument. The core of this cable will be, therefore, smaller than might be expected, and a consequent economy effected. It is with pleasure that one point can be singled out in the new scheme—that the lessons taught by experience, though thrown away upon some companies, are not so with the projectors of the present. The interruptions on our English cable, on the old Malta and Alexandria, in the Persian Gulf line, have proved indubitably the wise policy of a maintenance steamer, fitted with every necessary for undertaking any repairs. In the contract with the Maintenance Company, the British Indian Company take over their repairing ship, the "Chiltern." Should the line be laid, the vessel will always be there to repair any damage, though we must, in the interests of telegraphy, trust that

# THE WILSON BREECH-LOADING RIFLE.

it may be long before her services are required.

THE construction of breech-loaders upon the bolt system has received various practical illustrations at the hands of inven-

tors in this direction. The most prominent of these has been Mr. Wilson, who has spared neither time nor expense in rendering his gun the most perfect of the class it ably represents. The merits of this arm were made manifest on Friday last, the 29th ult., when a very interesting and satisfactory trial took place at the shooting range, Wormwood Scrubbs, in the presence of a number of distinguished officers and other gentlemen who met, at the invitation of the proprietors of the system, to witness the experiments. Amongst the company, we noticed General Sir Gaspard le Marchant, Gen. Boileau, R.E.; Captain O'Hea, Captain Le Marchant, Mr. O'Beirne, M.P.; M. Mariatini, the Greek Consul-general; General Hadji Shaw, of the Persian Legation; the Spanish Consul, Senor Bulleras; Senor Ponce de Leon, and other Spanish gentlemen; Mr. J. E. Barnett, Mr. Latham, Mr. P. Le Neve Foster, Mr. Casey, &c., &c. Before describing the rifle and giving the particulars of the trials, it may be as well to refer to some circumstances connected with the history of this arm.

It appears that an earlier model of the rifle (but without the recent improvements) was, some time since, after repeated solicitations from the Sub-Committee on Small Arms, at Woolwich, left there for examination and experiment. Either through negligence on the part of the Committee, or some other unexplained cause, Mr. Wilson was not permitted to be at the trials, nor even allowed the opportunity of examining his gunand pronouncing its mechanism correctly assembled previously to the experiments, although it had been several times stripped and distributed for examination while in the hands of the Committee. Under any cir cumstances, we should consider such a course on the part of a committee highly improper and reprehensible, whether regard be had to its own position and safety, or to the rights and interests of the inventor. In the present case, however, it is peculiarly so, inasmuch as on the trial of the gun, a mishap occurred, which may have been due to this very negligence of the Committee in not assuring itself that the gun was correctly assembled before commencing the trials, but which may also have been, and most probably was, due to a faulty cartridge, or a too sensitive or projecting cap. However this may be, it seems that the Committee, without stopping for reflection and fair examina-

tion, at once (and we think unjustly) credited the mishap to the system, without any reference to the more probable cause of the mishap—namely, the cartridge, although it is notorious that numbers of mishaps have before occurred with other guns from this cause. We mention these facts in the interest of inventors and the public generally, and because we consider it unfair that the public should be invited by advertisement, and solicited by committees, to submit to their fair and impartial examination the produce of its brains and po ket, and that when the moment for trial arrives, it should be practically ignored, and its property injured and denounced without a hearing. It is no wonder, in view of such circu matances, that the public is growing wary of Government advertisements and invention committees, and more especially when such committees avail themselves of the ideas and experiences furnished by the public, to concoct some invention of their own, to the prejudice and injury of those they have invited to serve them. It was under these circumstances, and because it is felt that obstacles have been thrown in the way of a fair trial of the Wilson gun at Woolwich, and thereby injustice done to a really valuable invention, that the proprietors of the system wisely determined to submit it to a public test, which, as already observed, took place on this day week. The construction of the Wilson rife will be seen from our engraving, to which the following description refers.

In our engraving, fig. 1 is a longitudinal sectional view of a portion of the Wilson rifle, the breech chamber being shown closed for discharge; A is the barrel, B is the breech shoe which is screwed upon the barrel, C is the shoe cap, which is case-hardened and screwed upon the shoe. The cap is formed with openings to allow the lugs on the locking handle to pass through and interlock with the cap, as seen in the engraving. D is the breech bolt which slides in the shoe B, and which is made hollow to contain the strike and its spring, as seen at fig. 2, which show an under side view of the bolt. E is the breech bolt end-piece, screwed into the place of the shank F forming a centre on which the locking handle partially rotates when the locking handle partially rotates when the strike is end-piece is shown at fig. 3. Fig. 3 shows the spiral spring which actuates the striker, fig. 5, and which is guided in

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action upon the rod a, fig. 3. The striker. fig. 5, is made of steel, and partially hollowed out for the spring, fig. 4, to work in, by which arrangement the advantage of a long and strong spring is secured. The striking point b is screwed into the body of the striker, and can be conveniently replaced, if broken.
The rear of the striker is shouldered and undercut at b<sup>1</sup>; on closing the breech bolt, this part engages with the head of the spring i, fig. 1, at the point i, which causes the compression of the spiral spring, fig. 4, on the breech being completely closed. On pulling the trigger, the spring is disengaged from the striker, and the striker is projected forward against the cap of the cartridge, and thus discharges the gun. G, fig. 1, is the locking handle, which is thoroughly case-hardened like the shoe cap in which it interlocks, a front end view of which is seen at fig. 6, c c being the locking lugs. Fig. 7 is a rear end view of fig. 6, showing the part d in which the spring plate, fig. 8, is situated. The spring plate e, fig. 8, carries a spring which rotates the locking handle G. This spring plate is held in place by the lugs f taking into the recesses g formed on the rear of the end-piece, fig. 3. H, fig. 1, is the handle cover plate which screws on to the extreme rear of the end-piece, fig. 3, and which is checkered on its upper face to facilitate the carrying and manipulation of the arm. Separate views of this part are shown at fig. 9. The handle plate is prevented from coming unscrewed by a small check pin, h. The main spring i, fig. 1, projects through the breech shoe B, and works in the slot j of the breech bolt (see fig. 2). The trigger k is jointed to the under side of the shoe cap, the toe of the trigger engaging with the underside of the spring i. I is the trigger stop lever, which is firmly jointed also to the shoe cap. The bent end of the lever, while in action, rests against the trigger shank, and prevents its movement. The rear end of the trigger stop lever is held down by the locking handle so long as the breech bolt remains unlocked, but when securely locked, the handle G, fig. 1, is partially rotated until the slot m, fig. 7, coincides with the rear of the stop lever, when the trigger k and the stop lever are free to move, and the gun may be discharged. n, fig. 1, is the trigger lock jointed to the guard, and is shown separately at fig. 10. The lock is shown open, but when the gun is loaded, and it is required to carry it so, the lock or plate is turned down against the trigger shank k, and, while in this position, the trigger itself is immovable, and consequently the discharge of the gun is rendered impos-

The gun is manipulated as follows:-The locking handle G is first gripped with the thumb and forefingers, and turned to the right, the plug D being withdrawn at the same time from the breech chamber. The cartridge is next dropped into the opening in the breech shoe, and the bolt pushed home with the hand, when the rifle is ready for firing. After firing, and on withdrawing the breech bolt for reloading, the cartridge case is extracted by the extractor hook o, fig. 1, which is attached to and carried by the breech bolt. This hook, on closing the breech, engages with the base plate of the cartridge, which, on being withdrawn by the extractor, is caught by a small tilting pin p in the bottom of the breech shoe, and is tilted from the chamber. It will thus be seen that two movements only are required in this arm for opening the chamber-extracting the empty case, and completely closing the gun for firing, which obviously renders the action the most simple and rapid hitherto produced, the movements, in fact, being reduced to the

ments of the inventor. The fifth was a well-finished pattern of the carbine, recently supplied by the proprietors, Thomas Wilson and Co., of 15, Cockspur-street, Charing-cross, to the French Government, and had the same bore and rifling as the Chassepot pattern. The ammunition was on the Boxer principle, with a bullet of pure lead weighing 400 grains, and having a solid flat base. powder charge was 75 grains, and the lubricating material pure beeswax. The trials commenced by firing ten rounds from each rifle, which was very rapidly accomplished, and the arms were afterwards minutely examined by those present; each gun was then fired for range and accuracy at 200 and 500 yards, and some very good practice was made at both ranges. At the latter, Captain O'Hea made five bull's eyes and eight centres in twenty rounds, not withstanding the wind was very strong and gusty, and blew across the range. One of the rifles was then fired by Mr. Wilson for rapidity and fouling, 100 rounds being discharged very rapidly and without intermission from one barrel, without watering or cooling. On examining the rifle after this test, the barrel, which was very hot, exhibited little or no sign of fouling, the breech mechanism was perfectly clean and cool, and the action worked as freely and smoothly as at the commencement of the trial. The extractors worked perfectly, and withdrew and tripped every cartridge case from the chamber with the greatest ease and certainty; in fact, nothing could exceed the smoothness and rapidity with which all the actions worked. One gentleman fired 12 rounds in twenty-eight seconds, shouldering the gun at each round. About 500 rounds were fired in all, and the trials gave general and marked satisfaction.

It is but fair to state that a number of missfires took place during the trial, but it was found on examination that they occurred only with the Woolwich-made cartridges, and that not a single miss took place with those made by Messrs. Eley Brothers—a fact much commented upon by those present. About 200 of the Woolwich-made cartridges were used at the trial, the rest having been supplied by Messrs. Eley Brothers, of the Gray's Inn-road. On dissecting several of the cartridges which missed fire, it was found that one was without an anvil, and another without any powder; the bullet cap and anvil in this cartridge were perfect, but having no powder the bullet remained undischarged; the cap, however, had been exploded. Failure in this respect could not of course detract from the merits of this arm, which, during Friday's experiments, proved itself to be—as far as those experiments went—a most efficient weapon, compact and simple in its arrangement, handy and effective in action.

# MANUFACTURE OF CAPS AND CARTRIDGES.

No. II.

ONCE determined upon putting into execution the design of establishing a manufactory, where the employment of fulminating ingredients would play a prominent part, M. Gevelot lost no time in carrying out the scheme. His first step was to purchase the stock-in-trade of many former manufacturers of those dangerous compounds, which many of them parted with, on comparatively easy terms, as they were heartily tired of their perilous business. Without being cast down by the difficulties in his path, nor by the frequent acts of treachery committed against him by some of his employés, who betrayed his secrets to his rivals lowest possible minimum.

There were five rifles used upon the occasion of the trial; four were of the new English pattern, 4in. shorter than the Enfield rifle, -450 bore, rifled in 6 grooves, with 1 turn in 25in., and embodied all the recent improve-

present time, owing to the care employed in the construction of the various buildings, and the manner in which the work is organized, no accident of a serious character has taken place. This is the more to be wondered at, as, in consequence of the enormous duties levied by the revenue authorities upon gun-powder, many manufacturers are in the habit of mixing a proportion of fulminating ingredients with the powder, the effects of which cannot be accurately estimated. Towards the close of 1836, the manufacture of cartridges for breech-loading sporting guns was commenced. It is generally considered the principle of loading guns and cannons by the breech, instead of by the muzzle, is quite a modern invention, but such is not the case. The first cannons were charged in this manner, and under the Renaissance, some were made upon that principle. But all these arms, from the "Amusette" of Marshal Saxe, to the guns with movable breeches which immediately preceded those of Lefancheux, were attended with too many practical defects and inconveniences, ever to gain universal favour. It is true, that the carbine of Lepage was tried in several cavalry regiments, but only for a brief period, as it ultimately failed to prove satisfactory. It must be kept in view, that it is not sufficient to obtain merely a happy combination of the different parts that compose a gun. Its successful working, and the facilities it will afford for rapid loading and firing, depend quite as much upon a multitude of conditions that must be fulfilled by the cartridge. Notwithstanding all that has been achieved, and even attempted, in this line, there is still abundance of room for further improvements. In describing in detail the manufacture of

cartridges, there are several particulars which will be treated of most effectually and succinctly by being introduced seriatim. is, first, the copper envelope or case; secondly, the fulminating compound itself; thirdly, the preparation of the felt; fourthly, the making up of the cases; and, fifthly, the filling or charging of them. All of these progressive operations will be fully described, and we will commence with the caps. They are formed of the purest red copper, chemically represented by the formula Cu 2 O, which must be possessed of an extreme degree of malleability. It is received at the establishment in the shape of long strips, which are thicker than are needed for the finished envelope. These strips are cut into short lengths, and passed through a succession of small rollers which reduce them to the required thickness. Everyone is familiar with the thickness of an ordinary percussion cap, and is aware that it slightly exceeds that of rather stout tinsel. After passing through the rolls, the short strips of copper are rendered case hardened, and so brittle that it would be impossible to use them in that condition. To restore to them the necessary degree of temper, they are rolled up, placed in a furnace, and annealed at a red heat. By these means, the ductility and malleability of the material is restored, but at the same time the colour is changed to a most disagreeable shade of dirty brown. The peculiar rosy tint of fresh copper is again imparted to it by plunging it into water strongly acidu-lated with sulphuric acid So 3, washing it after-wards in pure water, and finally beating it with woollen beaters in a quantity of sawdust. So soon as the surface has regained its proper colour, and become perfectly clean, the little fillets or rolls are submitted to the action of stamping machines, some of which act vertically and some horizontally, but all accomplishing the same result, with that identity and precision so strongly characteristic of the agency and operations of

the cap is caught by a small projecting arm. During the operation, small fragments are detached, which will be alluded to again in a future part of our articles. There are various descriptions of caps, some of which are smooth, and are cut and stamped out of a single piece of metal. This quality, which is also sometimes manufactured from yellow copper, Cu. O, serves for the priming of cartridges intended for sport as well as war, and also for that of the small cartridges of the "Flobert" gun. The whole category of caps embraces ten varieties. The first is that already mentioned, stamped out of a single piece of copper; the second is grooved upon the lower half; while the third is also grooved, but is, in addition, rendered waterproof by the placing of a small cover of tin over the fulminating powder. Under the fourth head, we have the ring cap, or that furnished with a large ring, to prevent all The fifth has an chance of explosion. hexagonal shape, with small facets upon it, which renders it easily manipulated. sixth variety, the rim is flattened out; and, in the seventh, the fulminating compound is placed at the other end. There is a notable difference in the eighth, which is of inferior quality, and manufactured of brass. As a contrast to its predecessor, the following is of the best quality, made from red copper, while the tenth and last constitutes the small specimens used in children's pistols and other warlike toys of a similar character.

Those caps that are intended for the old description of sporting gun, of which there are more in existence than is generally supposed, are prepared in such a manner as to obviate the possibility of driving a piece of the copper into the eye of the firer, an occurrence which is very likely to take place with the caps made all in one piece. The machine which cuts out the body or envelope of the cap, cuts it into four or six pieces, according to the type that is chosen. Thus, for the grooved cap, the copper is cut into four pieces or wings; into six, for the hexagonally shaped, or fifth variety; and into a similar number for the next in the above category, only that the wings are somewhat longer, in order to allow of their being turned up at right angles after the stamping has been When the copper is cut into this finished. shape, the punch descends upon it, and forces the fragments altogether towards the centre This joining is effected so completely that no seams can be seen until the cap has been exploded, which causes them to reopen. These latter descriptions of caps are grooved upon both faces, and marked with a G. which is the trade mark of the establishment, at the same time that they are stamped. The machines executing this work can turn out 130,000 caps in a day, and as they number, in all, ten, about a million and a-half can be manufactured, on a push, per diem. Previous to the operation of stamping, a small sponge, full of colza oil, is passed over the strip of copper, so that the caps, when first coming from the machine, are in a greasy condition. They are cleaned and dried by placing them in a barrel filled with sawdust, to which is imparted a movement of rapid rotation. This preliminary operation is sufficient to remove all grease from the caps, but does not bestow upon them that vivid tint they present to the eye when a boxful is opened for the first time. All that is necessary to impart to them this appearance is to subject them to a certain amount of friction. For this purpose, a large number of them are enclosed in an apparatus consisting of four sacks, stretched between the extremity of the four arms of a cross, which is caused to revolve. At each turn they are thrown, as it were, from one arm of the cross to the other, and, by the friction, not only obtain a brilliant polish, but become shorn of any little roughness and asperities that

facture of the copper pieces which constitute the base of the sockets or cylinders forming the envelope of the cartridges.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

A NEW PHOTOMETRICAL ARRANGEMENT-THE USE OF PETROLEUM IN PLACE OF BISULPHIDE OF CARBON IN THE VULCANIZATION OF INDIA-RUBBER -HYDROGENIUM.

AVING had occasion once or twice to refer to the imperfections of our methods of determining the relative luminosity of a gas flame, we may briefly refer to a new photometrical arrangement, devised by Mr. Crookes, which seems to possess some advantages over those in common use. The defects in these are of two kinds-one in the instrument itself, and the other in the standard of comparison. For the latter, sperm candles are now most commonly used, that is, candles o spermaceti, with just sufficient wax (about 2 per cent.) to prevent crystallization. Owing to various circumstances, which would occupy us too long to enter upon here, these candles burn with great irregularity. According to Act of Parliament, they should each burn at the rate of 120 grains per hour, and the Gas Referees have recently ordered that all experiments shall be rejected in which they have burned more than five grains above or below the standard. In fact, however, it is rare now to find candles which will burn within five grains above the standard. The fault, no doubt, lies chiefly in the wick, for spermaceti is a body of uniform composition, and the manufacturers of candles for gas testing have no temptation to adul terate it. The oil lamp of the Moderator or Carcel pattern, which is used in Paris, and recommended by some for adoption here, is open to most of the objections which apply to candles. To ensure anything like uniformity of combustion, nice attention has to be made to the manufacture of the wick, to the construction of the lamp, and to the regulation of the height of the wick while burning. A greater difficulty, porhaps, is to obtain oil of perfectly uniform character. In Mr. Crookes's plan, all difficulties, as regards the wick, and the composition of the burning material, are avoided. wick is a bundle of platinum wires of very small dimensions, and the combustible is a mixture of benzol and absolute alcohol. The recommendations of this lamp are obvious. Both benzol and alcohol are definite bodies, always obtainable in a perfectly pure state, and the wick being uniform and incomonly vary slightly with the temperature. The objection is that the standard of comparison will not be popularly understood. The public understand what is meant, when it is said that it will require fourteen candles to give a light equal that of a certain gas flame. But when it is said that a gas flame gives a light equal to that produced by the consumption of so many grains of benzol and alcohol, it does not convey a very clear idea to the public mind. This objection, however, is popular not scientific. The means of determining the point of equal luminosity also differs from that commonly employed. Instead of having to observe the equal illumination of a spot as in a common Bunsen's photometer, the experimenter has to observe two discs of different colours, which as the feebler light approaches the stronger become equal in tint—the point of equal illumination. By all experimenters not affected with colour-blindness, this point may no doubt be hit "with great precision"—with greater precision than by the use of the paper discs with the translucent spot, which, reason or other, vary greatly in sensitive-We have said enough to call attention to this instrument, which, now that the whole subject of gas examination is under revision, and pending the discovery of the means of making an absolute measurement of light, seems to us to merit a fair consideration.

The use of a mixture of bisulphide of carbon and chloride of sulphur for the superficial vulcanization of india-rubber, is open to some objections. In the first place, the vapour of bisulphide of carbon is exceedingly noxious to health, and its great volatility and the low igniting point of the vapour

petroleum in place of the bisulphide. For this purpose the petroleum must be completely deprived of water. This is done by first treating it with strong sulphuric acid and then after decantation rectifying it by distillation from caustic potash and a little oxide of manganese. Bisulphide of carbon is very cheap, but probably the rectified petroleum could be produced cheaper. In a sanitary point of view, however, it deserves consideration, independent of cost. One objection to the substitution may perhaps be found in the fact that petroleum is a much worse solvent for india-rubber than bisulphide, and the sulphur might not penetrate the rubber so well.

A few additional notes may be made to our short account of Mr. Graham's researches on the nature of hydrogen. This he regards as the vapour of a metal which he proposes to call Hydrogenium. In palladium, fully charged with hydrogen, he considers that there exists a compound of palladium and hydrogenium in equal equivalents. As regards bulk, he has established that the alloy must contain twenty volumes of palladium to one volume of hydrogenium. He considers that the latter metal possesses a certain amount of tenacity, and also electric conductivity, like other metals, and also that it must be classed among magnetic metals. Some consequences of Mr. Graham's discovery were pointed out by M. Dumas. "Water," he said. "must be recorded as the collection." must be regarded as the oxide of a metal.' Mr. Graham, however, has said that he has satisfactory evidence that oxygen, too, is a metal; hence we must look upon water as a metallic alloy. All the so-called organic bodies, M. Dumas also remarked, must be supposed to have a metallic basis. One other fact remains to be mentioned; the hydrogen at the moment of its liberation from the alloy in the gaseous form, is an excedingly active reducing agent, which seems conclusive as to the reality of the combination of two metals. Nascent hydroven, we all know, bears the same relation to ordinary hydrogen that ozone bears to ordinary oxygen, and in both cases we may suppose the superior activity to be a consequence of the condensation.

### INSTITUTION OF MECHANICAL ENGINEEERS.

THE twenty-second anniversary meeting of the members of this Institution was held on Thursday, January 28, in the Lecture Theatre of the Midland Institute, Birmingham; John

Penn, Esq., President, in the chair.

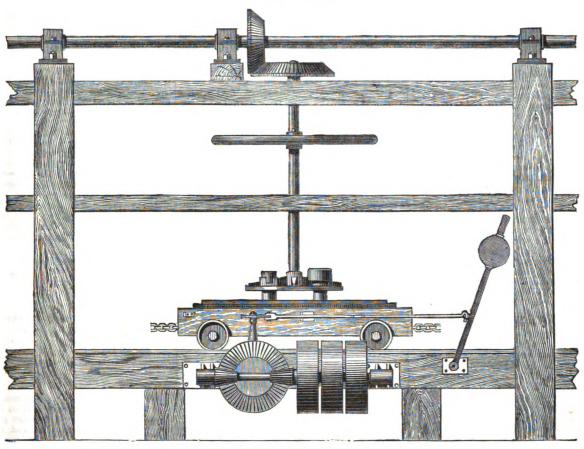
The Secretary (Mr. W. P. Marshall) having read the minutes of the previous meeting, the annual report of the Council was then presented, which wood the very satisfactory progress of the Institution during the past year, and its prosperous condition; and reference was made to the large and important meeting of the Institution held in Leeds last summer. The annual election of officers then took place. Sir William G. Armstrong being elected President of the Institution for the present year, the meeting of the Institution in the ensuing summer being intended to be held at Newcastle-Several new members were upon-Tyno. elected

A supplementary paper, by Mr. Charles Cochrane, of Dudley, was read, in continuation of the paper read at the previous meeting, "On the Further Utilization of the Waste Gas from Blast Furnaces, and the Economy of Coke due to Increased Capacity of Furnace." Taking the maximum limit to the size of a blast furnace to be that at which the temperature of the waste gas evolved from the furnace top will have become cooled down to the temperature of the external atmosphere, by its passage upwards through the materials contained in the upper part of the furnace, it was pointed out that in the Cleveland district this limit of size would be reached sooner than was represented in the previous paper, because in the calculation there given, a correction is required for the reduction in the consumption of fuel per ton of iron made in furnaces of increased capacity. reduction in consumption of fuel causes at the same time a corresponding reduction in the quantity of gas evolved per ton of iron made; and consequently, by reducing the proportionate quantity of gas to be cooled, will cause the actual reduction in temperature of the escaping gas to be greater than was obtained by the calculation given in the previous paper, so that the maximum size of furnace will be sooner arrived at. Without taking into account the effect of the increasing difficulty ex perienced in establishing an equilibrium of temmight have existed on their surface. In our is a constant source of danger from fire. Under perature between two bodies when they more next, we shall proceed to describe the manu-these circumstances, it has been proposed to use nearly approach each other in temperature, it was



# PYRENEAN MARBLE POLISHING MACHINE.

BY M. CANTET.



argued that the maximum size of furnace would be reached with a capacity of about 2½ times that of the present large Cleveland furnaces of 20,000 cubic feet capacity, supposing the calcined ironstone to contain 40 per cent. of iron, and the blast to be delivered into the furnace at a temperature of 1,000deg. Fah.; and in such a furnace it was estimated that the consumption of fuel should then be reduced to about 18cwt. of coke per ton of iron made.

The further question was also considered, whether a variation in the rate of driving of a blast furnace materially affects the economy of fuel; and the results were given of the actual working of two furnaces at the Ormesby Iron Works, Middlesbrough, the larger having nearly three times the capacity of the smaller. From this comparison, extending courselves are reviewed of working it was extending over long periods of working, it was shown that the differences in the rate of driving, though considerable in amount, did not sensibly affect the economy of fuel; leading to the con-clusion that an increased rate of driving of a furnace does not produce any unfavourable effect on the temperature of the escaping gas, but, on the contrary, is slightly favourable to economy of coke, within certain limits of variation in the rate of driving, according to each particular size of blast furnace

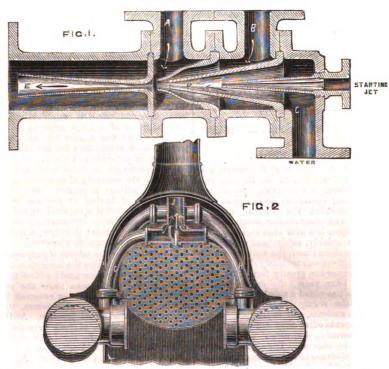
After the meeting, a number of the members and their friends dined together, in celebration of the twenty-second anniversary of the Institution.

## MARBLE POLISHING MACHINE.

A VERY large proportion of the marble used in France for building and decorative purposes is derived from Pyrenean sources, and of these the head quarters are at Bagnères de Bigorre. nead quarters are at Bagneres de Bigorre. Our engraving represents a simple machine for polishing marble slabs, invented by M. Cantet, of that place, and used in the works of the firm to which he belongs. In its action it somewhat resembles a belongs. In its action it somewhat resembles a planing machine, inasmuch as the little truck carrying the stone is propelled automatically backwards and forwards along its bed, and reversed as the polishers reach the ends of the slab. As the machines are used at present, several of them are ranged in line with the carriages connected by chains working round a drum under the frame, and attached to the bevel wheel shown in our cut. The action of this drum is reversed in the usual

#### THE EJECTOR CONDENSER.

MR. MORTON.



way by the lever balance weight and the three drums. Two projecting catches fixed to the truck impart the necessary movement for starting the reversing gear at the required moment. The marble to be polished is attached to the truck by a bed of plaster of Paris, and is acted upon by lumps of sandstone carried in the revolving wheel immediately above the stone. These pieces of sandstone are dropped into ferrules carried in the wheels stone are dropped into ferrules carried in the wheels after having been roughly shaped, and are pressed upon the stone by heavy cast-iron caps resting on the top of the polishing stones, so that as they wear they are still kept in contact with the face of the They measure five metres in height by about sixty-

marble. In the illustration, one of the caps is removed to show the head of the stone. A constant stream of water is kept flowing over the marble surface. After it has been sufficiently ground, it is finished by polishing with colcothar. The works of Messrs. Cantet Frères have been six years in operation. The amount of marble worked per week in their ateliers amounts to upwards of seven cubic metres, all of which is excavated from their quarries, about four miles to the south of the town. Eight of the large polished marble columns for the Grand two centimetres in diameter, and weigh 4,000 kilogrammes each. They were each turned out of a solid block, in a huge lathe specially constructed for the purpose, and, we understand, cost £200 each delivered at their destination.

### MORTON'S EJECTOR CONDENSER.

T the thirty-first annual meeting of the Liver A pool Polytechnic Society, held November 21, 1868, the president, Mr. J. T. King, read an address, in the course of which he referred to the progress of mechanical engineering. Under this head occurs the following description of Mr. Morton's ejector condenser. In mechanical engineering, Mr. Alexander Morton, of Glasgow, has devised and successfully carried into use most valuable improvements in connection with the steam engine. A correct appreciation of the merits of induced or what are known as lateral induction currents of fluids by jets, has enabled Mr. Morton to give to the world means whereby the benefit of a partial vacuum on the exhaust sides of the pistons in locomotive engines can be secured without working parts, and the benefit of a perfect or almost perfect vacuum in other engines where a supply of water is available, without the employment of an air-pump and also without working parts. In the engraving, fig. 1 is a longitudinal section of that modification of the new apparatus used by Mr. Morton on a pair of engines with inverted cylinders, and by which a of engines with inverted cylinders, and by which a steady vacuum of over 12lb, was maintained. A and B are the exhaust passages; C water supply passage; D central nozzle; E induction tube. When the engines are at work, the exhaust steam is condensed by the water to which it gives motion through C and D, and the speed given to the water escaping through E, maintains the vacuum. F is a steam nozzle for blowing through; where a head of water is available, this can be dispensed with. Fig. 2 shows sufficient of the invention to illustrate its application to a locomotive with outside cylinders. G and H are the exhaust pipes; these terminate in nozzles I and J, the one encircling the other. The exhaust steam from one cylinder produces a partial vacuum in the exhaust passage, and on the back of the piston in the other cylinder.

An invention of this kind needs no recommenda-

tion. It commends itself the instant it is mentioned. If in practice it is only as economical as the air pump, the dispensing with that alone is of the greatest importance; but that it does more, has been certified on the high authority of Professor Macquorn Rankine, whose experiments will no doubt shortly be made public. Coming as it does doubt shortly be made public. Coming as it does within a few months of one hundred years after James Watt's grand conception of the separate condenser, it is an indication to engineers that economy is to be effected where least expected.

## EXPLOSIVE COMPOUNDS FOR ENGINEER-ING PURPOSES.

By Mr. Perry F. Nursey.

A T a meeting of the Society of Engineers, held February 1, 1869, Mr. F. W. Bryant, president, in the chair, the following paper was read:—Engineering operations have from the earliest period included the removal of large masses of rock and other similar natural formations, and the object has ever been to effect their displacement as quickly, safely, and cheaply as possible. In the olden times, the work of removing these obstructives was tediously slow, but the invention of gunpowder greatly facilitated such operations. In later years, the development of chemical science has added a number of explosive compounds to the scanty list of those at the command of the ancients, and in the present day we have many agents other than gunpowder, and much more powerful, by which blasting and quarrying may be effected. The objects in view in producing a substance to supersede gunpowder, are—or, at any rate, should be—to obtain a material which shall possess a more violently explosive action; which shall either cost less, or what is the same thing do an access or greater. what is the same thing, do an equal or greater amount of work with a lesser quantity, and, above all, which shall be non-explosive except under the actual conditions of work. This latter quality is, perhaps, the most important, and has been rendered so by the innumerable accidents which have happened with gunpowder either when in store or at the time of use. The purpose of the present paper is to notice what has been done towards superseding gunpowder, and to indicate the substances which practical experience points

out as being the best to take its place in engineer

ing operations requiring its aid.

Although many attempts have been made to supersede gunpowder, but few have practically succeeded, and this arises not so much from any inadequacy on the part of the substitutes, as egards power, but on account of the extreme liability of most of them to premature explosion from varying causes. Gunpowder itself is open to this objection, and hence the propositions to reduce the risk by mixing it with protecting ingredients. But this is not enough: we must go a step further. What is required is a material over which we can have perfect command, one which shall do no more than burn when in contact with air, but which shall equal, if not exceed, gunpowder in its power when ignited in an air-tight chamber, as in a bore-hole, or the barrel of The necessity for this is evidenced almost daily in one or other of our mining districts, where a large percentage of the explosions occur in the blasting operations. How frequently is gunpowder ignited by stray sparks, even when standing about, but much more frequently do accidents arise when tamping is going on. Here the contact of the metal rod with the rock leads to many a fearful accident. So much is this so, that the Royal Cornwall Polytechnic Society have taken the matter up, and have suggested safe methods of performing this dangerous operation. But however areful a miner may be, there never can be perfect immunity whilst he has to deal with a material which carries within itself all the elements of danger and destruction. To meet the case, a perfectly inexplosive material is required, one which will not explode so long as the atmosphere has access to it, but in which all the active energy of gunpowder is developed immediately it is fired out of contact with the air.

Gunpowder itself is at present more largely used than any other explosive material, and it is a remarkable fact that notwithstanding the centuries which have elapsed since its first discovery, no radical or permanent change has been effected in its composition. Slight variations, it is true, have been made from time to time in the proportion of its constituents, but, in the main, gunpowder remains much as it was 600 years ago. But the danger ever present in handling this material has always been so patent that many years since means were devised for rendering it harmless while in use. Colonel Ryley was the first to propound this theory, and he submitted his plans for enveloping the grains of gunpowder in bone dust, to the Government some twenty-five years since. In later times-in fact, very recently-Mr. Gale's proposition to render gunpowder non-explosive and explosive at will has been much before the His plan was to mix ground glass with the powder for storage and transport, and to sift it from it again when it was required for use This addition of a large amount of a foreign substance with the powder no doubt answers the purpose most effectually; but unfortunately there are practical difficulties in the way of its adoption. The objections are, increased bulk and weight for transport, the necessity of numerous sets of mixing and sifting apparatus, and the utter impropriety of having to prepare an explosive material just when it is required for use. Besides, in blasting operations, the accidents usually occur in charging the mine; therefore, a system of this kind would be of no value whatever.

Before quitting the subject of gunpowder, it may be interesting to notice the force this material is capable of exerting when used for blasting purposes. The following particulars show the amount of earth or rock thrown down or removed by 1lb. of powder under various circumstances, the results being taken from actual practice. At the Round Cliff, Dover, 85,232lb. of chalk were thrown down by 1lb. of powder. In the Leith cutting, Tun-bridge, 31,860lb. of hard white sand were moved by the same weight of powder. At Plymouth 22,000lb. of limestone were moved per lb.; in small charges only 8,900lb. were moved. In Antrim, 45,084lb. of white limestone, and 32,430lb. of winstone or basalt were moved by 1lb. of powder. At East Dunmore, 14,280lb. of hard conglomerate were moved; and on the Londonderry and Colembia 23,400lb. raine Railway, 22,400lb. were thrown down by 1lb. of powder. Taking the mean of these results, we have 32,832lb. of material to 1lb. of powder.

Numerous compounds have been brought forward from time to time, for which it has been claimed that they perfectly superseded gunpowder. But, until very recently, no material has been found

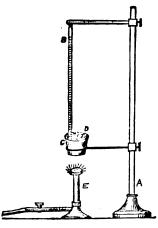
fulfil perfectly all the conditions and requirements of that most important material. Saltpetre is the agent to which the characteristics of gunpowder, as an explosive material of permanent character, are mainly due. It is to the substitution of other nitrates for this constituent that most attention has been given, and the nitrates of sodium, lead, and barium have been successively tried. But although the products, which have been known by the names of soda-gunpowder, and barytic-powder, &c., have obtained a certain amount of temporary success, they have ultimately been abandoned. In fact, all mixtures of this class, when compared with gunpowder proper, have been found to exhibit important and radical defects. Chlorate of potash has been a favourite substance with inventors, notwithstanding its violently explosive nature. The object has, of course, been to tone down its violence by proper admixture with other ingredients, and the resulting products have been to some extent successful. One of the earliest mixtures of this class was German or white gunpowder, which was tried, but proved unauccessful. Many preparations of a similar character have also been brought before the public. Of this class is Ehrhardt's powder, the invention of which is also claimed by Mr. Horsley. M. Ehrhardt's compositions are as follow :-

• •							
BLASTIN	iG :	Po	WD	KR			
Chlorate of potash						ł	part
Nitrate of potash						ł	11
Tannin or cachou						1	99
Charcoal			•			9	,,
Powder P	OR	Λı	tTI	LLE	CRY		
Chlorate of potash						1	part
Nitrate of potash						1	- ,,
Tannin						1	"
Powder	PO	R S	не	LL	s.		
Chlorate of potash						1	part
Tannin						1	- ,,

Mr. Horsley's powder is a compound of chlorate of potash and gall nuts in proportion by weight of three to one. The ingredients are ground sepa-rately to a state of fine powder, and then passed, also separately, through a very fine wire sieve. The two ingredients so prepared and thoroughly dried are blended when required to form the explosive compound. The blending of the ingredients is safely and easily accomplished by passing them in a mixed state through a series of horsehair sieves arranged one below the other, and set in motion. Upon the upper sieve the two ingredients are first mixed by being run together from two receptacles placed above the sieve, one containing a given weight of chlorate of potassa, and the other one-third of such weight of gall nuts. As the chlorate of potash is much heavier than the gall nuts, the volumes or measures of the two receptacles are about equal. Motion being imparted to the sieves, and as the two finely ground ingredients pass downwards through the sieves, they become blended, and form the explosive compound. Powders in which chlorate of potash is an ingredient are undoubtedly somewhat dangerous. The fact, however, of cannon priming tubes, which are composed of chlorate of potash and ter-sulphide of antimony, having been prepared, stored, and used for more than thirty years past without accident, ought to relieve apprehension on that score. ought to relieve apprehension on that score. When treated, as it should be, with care, and not improperly blended with combustibles, chlorate of potash is practically safe. With regard to the explosive powers of Horsley's powder, it may here be interesting to adduce a few facts in the shape of results of trials which came under the author's notice, and which were made to institute a comparison of its strength as against gunpowder. eprouvette, weighing with its carriage 10lb. 20z., was placed on a fir plank in a perfectly level position. The charge in each instance consisted of position. The charge in each instance consisted of 50 grains of the various powders, and was kept in place by a small wad of thin paper. The recoil of the eprouvette, when charged with fine grain sporting powder, was 9-16in.; with very fine grain sporting powder, 11-16in. Fine grain sporting powder in a state of meal, and compressed by a weight of 400lb, on the square inch, gave a recoil of 42-16in. Horsley's powder in a similar state of meal, and with a similar pressure of 400lb, per square inch, showed a recoil of no less than 119-16in. These results afford some idea of the relative power of Horsley's powder and the best gunpowder. power of Horsley's powder and the best gunpowder. The author has examined some blocks of elm which had been submitted to experiment to show the comparative disruptive force of Horsley's that they perfectly superseded gunpowder. But, powder and of common gunpowder. In each until very recently, no material has been found case equal charges were used, and the eprouwhich would answer all the practical purposes, and vette was discharged one inch from the wood

and at right angles to its face. The disruptive force of Horsley's powder on the wood was as if a solid body had been driven into it, separating the fibres and tearing a hole completely into it. The force of the small grain best sporting powder merely left a mark upon the surface of the blocks.

And here the author would slightly digress to say a few words upon the ignition point of explosives. Although the temperature at which explosive compounds will ignite is an important element in the investigation of their character, the author is not aware that any but the rudest means have hitherto been adopted to ascertain their ignition point. In one instance which has come under his notice, these means consist simply in placing the powder to be tried in one of a pair gun barrels, a thermometer being inserted in the other. On the application of the required heat, the powder ignited, and the temperature was registered by the thermometer in the other barrel. But this plan is open to objection on account of several defects, which will be apparent from the comparatively rude nature of the test. defects, however, are entirely absent from the apparatus shown in the annexed woodcut, and thich was devised by Mr. Horsley, for ascertaining the ignition point of explosives. This it does with the greatest exactness in all cases, giving the most satisfactory results. It consists of a stand A,



from which is suspended by the upper arm a thermometer which is graduated to 650deg. This thermometer dips into the oil bath C which is held by the lower arm. D is a small cup which floats in the oil, and in which the explosive is placed. The oil is heated by the flame from the gas jet E, which is furnished with a stop-cock for regulating the tlame. As soon as the temperature of the oil reaches the ignition point of the powder, the latter explodes, the exact degree being correctly registered By this apparatus, Mr. the thermometer. Horsley has ascertained the ignition point of various explosives, and the following are among some of his results: - Gunpowder ignites at a temperature of 600deg. Fah. A sample of Mr. Horsley's powder gave 430deg, as the ignition point. Guncotton of a powerful character, prepared by Mr. Horsley, ignited at 325deg., whilst some of Prentice's sporting gun-cotton exploded at 410deg. Trials of Schultze's sporting powder gave 385deg, as the ignition point. It is as well, at a time like the present, when new explosive compounds are constantly being brought under notice, that experimenters should know the character of the material they are dealing with, and which they will be enabled to ascertain by means of the above simple apparatus.

Another, and perhaps safer, application of chlorate of potash to the purpose in question was made some nine years since by M. Hochstädter, a German chemist. Unsized paper was thoroughly soaked in, and coated with, a thin paste consisting of chlorate of potash, finely-divided charcoal, a small quantity of sulphide of antimony, and a little starch, gum, or some similar binding material, water being used as the solvent and mixing agent. The paper was rolled up very compactly and dried in that form. In this manner, very firm rolls of an explosive material are obtained, which burns with considerable violence in open air, and the propelling effect of which, in small arms, has occasionally been found greater than that of a corresponding charge of rifle powder. Moreover, the material, if submitted in small portions to violent percussion, exhibits but little tendency to detonation. But as no reliance can be placed on a sufficient uniformity no reliance can be placed on a sufficient uniformity of action, in a firearm, of these explosive rolls, this alone sufficed to prevent their competing explosive power. Here, then, is a powder, which

with gunpowder. The same description of explo sive preparation, differing only from that of M. Hochstädter in a tritling modification of its composition, was again brought before the public in this country in the early part of 1866, having been patented by M. Reichen. The author has used this patented by M. Reichen. The author has used this gun-paper with very good results in rifle shooting but nothing practical appears to have been done with the material.

The mixture previously referred to as German or white gunpowder consists of chlorate of potash, ferrocyanide of potassium, and sugar. Many years since, it was proposed and tried without success as a substitute for gunpowder. Since then various preparations of similar character have been suggested for employment, either as blasting and mining agents, or for use in shells, or even for all the purposes to which gunpowder is applied, The most recent of these mixtures, with which the author is acquainted, is a white gunpowder made by Mr. H. W. Reveley, of Reading. This mixture is a perfectly white impalpable powder resembling flour, powdered chalk, or magnesia in appearance. Mr. Reveley recently informed the author that he has constantly made and used it in preference to the ordinary gunpowder, both on account of its superior propelling power-which is at least one-third greater-and its perfect clean-It produces neither smoke nor flash of flame at the muzzle on discharge, and can be used in a casemate with perfect comfort to the gunners Mr. Reveley has used it for every purpose to which ordinary gunpowder is applicable, and invariably with the most perfect success. He has made many parcels of the white gunpowder during the last ten years, and has always found them uniform both as regards strength and other properties, and he has never met with the slightest accident. although he has tested it very severely. The composition of white gunpowder is as follows:-

> Chlorate of potash Chlorate of potash . . . 48
> Yellow prussiate ditto . . . 29 Finest loaf sugar

> > Parts by weight .

In manufacturing this powder the yellow prussiate is dried in an iron ladle until it is as white as the chlorate. The ingredients are ground separately to very fine powder, and are then mixed by means of a conical sieve until they are thoroughly incorporated, but not by trituration. For small quantities, Mr. Reveley uses a common Wedgewood mortar and pestle, which must be perfectly dry and The operation does not take many minutes, and with the above precautions, its manufacture is free from danger. In loading, it is treated in the same way as ordinary gunpowder, being pressed down by hand solid, but not hard. The charge is down by hand solid, but not hard. ignited in the usual way, with a common cap and In actual use, it does not appear to possess a bursting so much as a propulsive power, and Mr. Reveley has obtained some of the highest penetrative results in his rifle practice with it. economy of this powder will at once be apparent, when it is stated, that its wholesale cost is about 86s, per cwt., but as its strength is at least onethird greater than that of ordinary powder, its cost may be comparatively estimated at about 60s. per One important feature in the manufacture of white gunpowder is that it does not require to be -indeed, it cannot be-granulated, which process is the great source of danger in powder-mills. The universal use of the cartridge entirely obviates any objection that may be made to white gunpowder on that score, or on the score of similarity in appearance to other substances, and, owing to its compact form, it only occupies half the usual space. Besides the foregoing, there have been several cruder applications of chlorate of potash in the production of explosive compounds, which it is unnecessary here to notice more particularly.

Amongst other materials, wood has been pressed into service to the aid in superseding gunpowder as a practical explosive. Soon after Schönbein's discovery of gun-cotton, a Prussian artillery officer, Captain Schultze, whilst investigating the subject conceived that finely divided wood could be con verted into a controllable explosive agent more readily than cotton. He produced the substance known as gun-sawdust, the explosive properties of which are mainly due to its impregnation with a large proportion of an oxidizing agent. In preparing the gun-sawdust, the wood is purified from all resinons substances, and is digested in a mixture of sulphuric and nitric acids. This gives a very feeble explosive material, which is further

may be preserved in a comparatively harmless condition until required for use, when it may be rendered powerfully explosive by impregnation with the nitrates. Although its properties are somewhat similar to those of gun-cotton, many of the advantages of which it possesses, it is open to one very fatal objection. To be within the limits of safety, completion of its manufacture must be delayed until the moment it is required for use: and, moreover, the final ingredients are the most dangerous, and require refined manipulation. It is needless to point out how incompatible the conducting this completing process is with the ordinary details of mining; the care and nicety required in such a chemical operation must be referred to the skilled operator, and not trusted to the rough-and-ready hand of the miner. Practical safety can only be attained by an explosive agent into which the stray spark may fall without producing more than a gush of flame, a gradual burning, or without causing ignition at all, but which, nevertheless, when properly rammed home and tamped, may be fired with results at least equal if not superior to ordinary gunpowder.

During the year 1866, a new kind of blasting powder, which promised to supersede gunpowder in mining operations, was introduced to public notice in England. This was the invention of M. Gustave Adolph Neumeyer, of Taucha, Saxony, and to which the term "inexplosive" may appropriately be applied, inasmuch as there is no possibility of its exploding, either during its manufacture, storage, or manipulation. Not until the proper moment of ignition arrives, when it is well rammed home and prepared to do its work, is its energy developed. Then, and only then, it manifests a power, when used weight for weight, considerably in excess of that possessed by gunpowder. M. Neumeyer, all his life connected with the management of quarries, and himself the possessor of a quarry near Taucha, had his attention forcibly drawn to the distressing accidents, which are of such frequent occurrence in blasting operations, and he conceived the idea of producing a blasting powder which should combine the desired degree of strength, with perfect safety when in work. After a long series of trials and experiments, he succeeded in effecting his object, by the invention of a powder which unites in itself the above important qualities. Within two years from the date of his discovery, M. Neumeyer was manufacturing this powder on a large scale, extensive mills with steam power having been erected for its production in the city of Altenburg, and in two other places in Gormany.

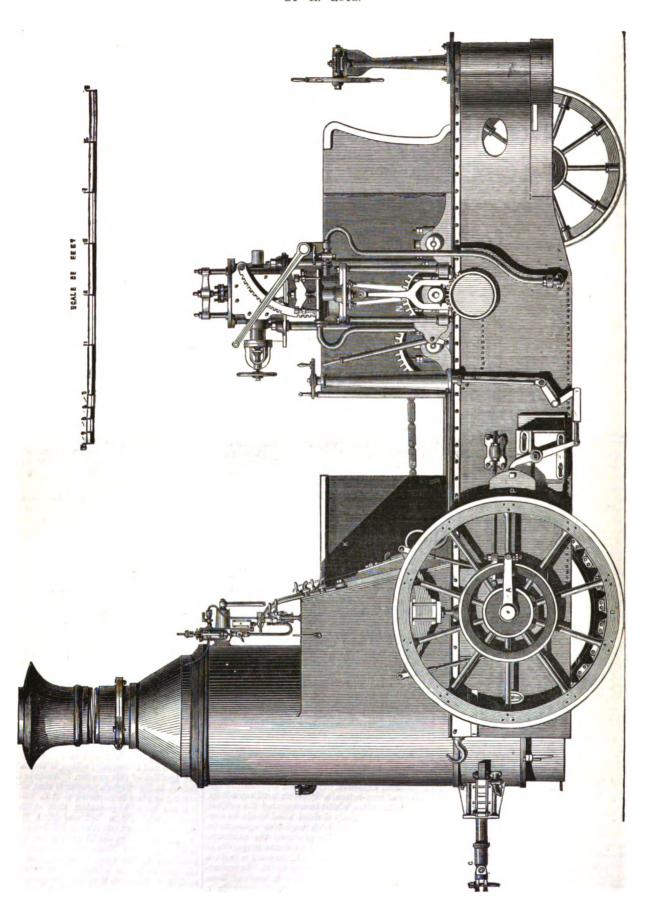
Although Neumeyer's powder differs in colour as well as in action from gunpowder, in that it is slow burning instead of violently explosive when in contact with air, it is composed of precisely the same materials as ordinary gunpowder. To these no other substances are added, the whole secret of the extraordinary result arising simply from the method of proportioning and compounding the ingredients. A reduction is made in the amount of sulphur employed, by which means a much smaller quantity of the noxious vapours is evolved on its ignition than is produced by the combustion of ordinary gunpowder—a point of great importance in underground mining operations. Some difference is made in its preparation, according to the use for which it is required, whether for military or for mining purposes. As a consequence, there results, in the former case, a powder which, when hermetically confined, explodes at the same temperature as ordinary gunpowder, whilst when prepared and charged for blasting purposes, it requires a somewhat higher temperature. so far from being objectionable, is positively advantageous, inasmuch as it makes the possibility of accidental ignition more remote. Bickford's of accidental ignition more remote. Bickford's safety fuse, which is now so extensively used in our own and continental mines, is best adapted for the ignition of this powder. Another important feature in Neumeyer's powder is that, although no Another important coating or glaze is imparted to it in manufacture, it is not more hygrometric than ordinary gunpowder, whilst, if wetted and dried, it is said to retain all its good qualities in full force. Ordinary powder is more powerful as the size of the grain is increased, but Noumeyer's powder, when in a condition of fine dust, is equally if not more efficient than the other. From what has been efficient than the other. From what has been said, it will be seen that the new gunpowder embodies safety in manufacture, in transport, and in handling, preparatory to actual use, whilst it has been proved to be superior to ordinary gunpowder, in point of effective power, so that it may fairly be

(Continued on page 106.)

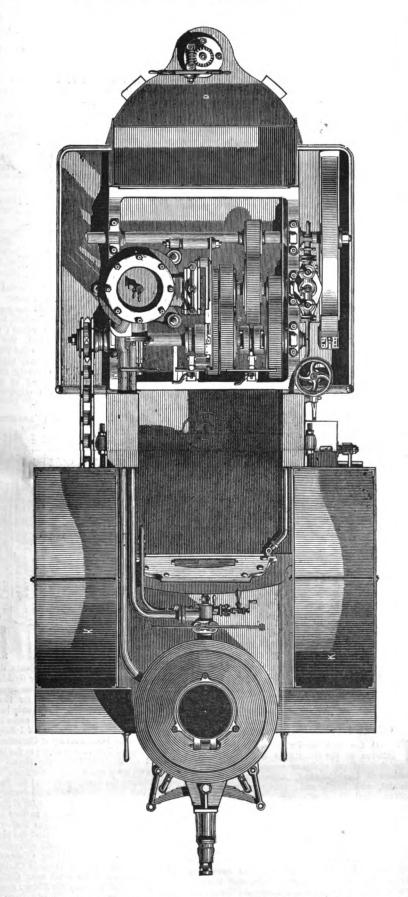


# $T\ R\ A\ C_{_{\!A}}T\ I\ O\ N\quad E\ N\ G\ I\ N\ E.$

BY M. LOTZ.



# TRACTION ENGINE.



FRENCH TRACTION ENGINE.

the accompanying engravings we illustrate a French traction engine, which was turned out from the works of M. Lotz, at Nantes. It is on the vertical cylinder principle, and we are at a loss to understand the maker's reason for reverting to such an inconvenient system. We give the drawings, however, as illustrative of a style which

our foreign maker prefers to adopt, and which he considers perfect. We are unable to furnish our readers with the dimensions of this engine, inasmuch as M. Lotz considers that having spent much time and incurred considerable expense in arriving at what he considers perfection in proportions, he would be a loser by giving to the public information which he values

NEW YORK ASSOCIATION OF ENGINEERS.

IN answer to a circular dated January 12, 1 Nanswer to a circular dated January 12,
1869, about one hundred practical engineers
met on the 15th, at the Howard Mission Hall,
40, New Bowery, New York, for the purpose of
organization. William W. W. Wood, Chief Engineer of the United States Navy-yard, Brooklyn,
was called to the chair, and Mr. G. Weissenborn was called to the chair, and Mr. G. Weissenborn was appointed secretary. After a report was submitted by Mr. George P. Clark, chairman of the committee on organization, Mr. Weissenborn, in response to a request, read an address, in which the importance of union and co-operation was fully detailed. Mr. Hazwell then submitted the collaming reports are applied for experimental which following report as a plan for organization, which was debated, and finally, after some amendments,

The committee appointed at the last meeting of engineers, at the rooms of the Liederkranz Society, in Fourth-street, on the evening of the 9th inst., having considered the matters referred to them, submit the following recommendations

for the consideration of this body:

That the engineers of other States of the Union be invited to form associations, and that, when formed, that they appoint delegates to a general convention of State organizations to represent them in a body to be known as the American Association of Engineers.

That all the subserbers to the prospectus of Mr. L. Weissenborn be neid to be members of this con-

vention.

That the title of this association shall be the New York Association of Engineers. That the officers of this association shall consist

of a president, three vice-presidents, a corresponding and recording secretary, a treasurer and an executive, finance and lecture committee, each of five members.

That the stated meetings of this association

shall be monthly.

That the names of all candidates for membership shall be submitted at a stated meeting, endorsed by ten members, and that they may be voted upon at any subsequent stated meeting. Five black balls or negative ballots shall exclude an applicant from membership.

That the committee on lectures shall report a system of lectures to the president, to be submitted by him to a board of all the officers of the association, and, if approved of by it, said system shall be the rule of proceedings, and that this committee shall then call a meeting of the association

at as early a day as may be practical.

After adopting this for a plan of organization, After adopting this for a plan of organization, and appointing a committee to nominate officers at the next meeting, it was resolved to authorize the chair to appoint a committee on lectures at once. This committee was thereupon named by the chairman, as follows:—Messrs. Raymond, Vanderbilt, Babcock, Holmes, Maine, Germain, and General Burger. Resolutions of thanks to the temporary officers, and especially to Mr. Weissenborn, as the originator of the association, having been passed, a motion to adjourn was adopted, and, by request, the Rev. Dr. Ward, president of the Howard Mission, closed the proceedings with

A NEW AMERICAN BREECH-LOADER.

A NEW breech-loader, the invention of a New Yorker, was recently tried at Springfield Arsenal before a party of gentlemen interested in firearms. A local paper says of the invention:—It introduces a new principle in weapons of this kind, and is said by experts to comprise their excellences and to overcome many of their disadvantages. The essential feature of the new gun is in the mechanism of the lock, which entirely does away with the old-fashioned lock or hammer, and substitutes in its place an ingenious yet simple contrivance which fixes the cartridge and discharges the shell from its chamber with great rapidity and absolute certainty. This "unit lock," as it is called, is in one piece, and has no complicated screws or machinery liable to get out of order or embarrass the operator. There are, besides, other important features, such as a graded raised sight, fitted upon ratchets, which would seem to increase the general efficiency of the arm. This invention was perfected the present year; but it has already been tested by the Prussian, Belgian, and Austrian Governments, and the official reports of these trials speak in high terms of the new breechloader, as do also those at the armoury here who have seen and examined it. The trial was considered generally satisfactory. With the Remington cartridge accurate shots were made at 200, 500, and 700 yards distant, and in quick firing ten shots were discharged in twenty seconds, and twenty shots in fifty-two seconds. The inventor claims that twenty-five shots can be fired in a minute with more, than ordinary accuracy. ordinary accuracy.



(Continued from page 103.)

said to be a safe and efficient substitute for our old powder.

In support of the above assertions, both of its inexplosiveness and explosiveness, the author would observe that he has made some trials, which proved conclusively that Neumeyer's powder possessed both those qualities. But as a greater value attaches to trials made publicly, and the results of which have been placed publicly on record, the author prefers to give these in place of his own limited experience of this powder. First, then, as to its inexplosiveness. This was proved by several experiments made in the grounds of the Crystal Palace in December, 1866. The most con-Crystal Palace in December, 1806. The most conclusive test of this quality of the powder was the following:—A small house, 5ft. square, built of brick and roofed with slate, and having two chimneys made of 5-inch drain pipes, was constructed, and in it 35lb. of Neumeyer's powder, half blacking and half gunnowder were alleged. half blasting and half gunpowder, were placed. On firing this mass an immense body of flame issued through the openings in the roof, but the powder simply burnt, and moved neither brick nor slate. On 3lb. only of ordinary gunpowder being placed in the same structure and ignited, a violent explosion took place, which rendered the building a mere wreck.

With regard to its explosiveness, the author has a number of authenticated reports of numerous and varied trials illustrative of this quality. A few are selected which have been made in mines and quarries in England. The first trials to be noticed were made on the 4th of December, 1866, at the Bardon Hill and the Markfield Granite Quarries, situated near Leicester, and owned by Messrs. Ellis and Everard. The rock at Bardon Hill, which is of a very hard and stubborn character, was rent and cracked in a most satisfactory manner, and a large quantity of material was thrown down, the results being considered highly successful. At the Markfield Quarry one hole was bored horizontally at the foot of an unbroken face of a large extent of solid rock; others were bored vertically. On firing the horizontal hole, the face of the rock was blown out to a considerable extent n every direction, and an unusually large amount of stone was displaced. The vertical shots proved equally successful, and the results generally were highly satisfactory, the quantity of the new powder used being less than that of ordinary powder required for the same amount of work. In a hard, compact rock, too, such as at Bardon Hill, the effect produced by a given quantity of the new powder is much greater than that produced by an equal quantity in a soft or loose rock. It may be as well to mention here that, bulk for bulk, as well to mention here that, bulk for bulk, Neumeyer's powder, when well tamped, is equally as strong, if not stronger, than ordinary powder; whilst weight for weight, Neumeyer's powder is the stronger of the two. In point of weight, the new powder is one-sixth lighter than the old, which, supposing we take them at even prices, gives over 15 per cent. advantage to the former, owing to the fact that bulk for bulk (or one-sixth less weight) gives an equal if not a superior result to the best ordinary powder.

Having seen the successful action of the powder

upon granite, we will now notice its behaviour in slate quarries. On the 11th of Docember, in the same year, five shots were fired at the quarries of the Welsh Slate Company, Rhiwbryfdir, Car-narvonshire. The first shot was in hard rock, the hole being 2ft. 6in. deep, and 14in. in diameter; 21in. of the new powder was used, and was found to do more work than the same bulk of ordinary powder. The second shot was fired in a hole of the same diameter as the last, but 3in. deeper, cut in the same description of rock; the same depth of powder was used, the result being similar to that obtained with the first shot. Shot No. 3 was in a hole 3ft. 6in. deep, by 14in. in diameter, the material bored being pure slate or pillaring rock; the powder filled the hole within 1in., which was occupied by the tamping. The result of this shot occupied by the tamping. The result of this shot was the discovery that the powder was much too powerful—a fault certainly on the right side, and one easily remedied. The next hole was in the same rock as the last, and was 5ft. 8in. deep, with 4ft. 6in. of powder and a light tamping; this exceedingly satisfactory results. In another 14-inch exceedingly satisfactory results. In another 14-inch hole, 4ft. 6in. deep, 2ft. of powder was used, with 2ft. 6in. of hard tamping; the result of this shot was decidedly good, the rock being shattered. On the following day three more experiments were made at the same quarries. With 2ft. 6in. of powder in a 14-inch hole, 3ft. 6in. deep, the shot proved much too strong. The second shot was proved much too strong.

highly satisfactory; but in the third too much power was again developed.

The general result of these experiments is to prove that, bulk for bulk, Neumeyer's powder is much stronger than the powder in ordinary use at these quarries, and which was of the very best description. The question, therefore, arose as to how the strength was to be reduced when pillaring. It was proposed to have paper cartridges of much smaller diameter than the holes, and which would hold only about one-third or one-fourth of the present charge of powder. These cartridges, it was believed, would answer the purpose exceedingly well in the pillaring rock, where it was desirable to cleave the slate without fracture, and would besides produce a very considerable saving of powder.

A few days after the foregoing experiments, a series of trials were made with the new powder at the slate quarries of Messrs. Matthews and Sons, at Festiniog, Merionethshire. Here two holes 2ft. deep, in a hard rock of an underground chamber each half filled with Neumeyer's powder, and two similar holes in a slate rock, were fired with perfectly satisfactory results. Two more shots in the hard rock of the tunnel were not quite so successful; but it was owned that the tamping had been imperfectly rammed, the man having fired them before they were inspected. The two next shots were stated to have done as much with 11in. of Neumeyer's powder as with 15in. of ordinary powder. In another hole in very hard rock of the tunnel, the result was completely successful, it being stated that with ordinary powder two holes would have been necessary, or the shot would not have succeeded in effecting the required detachment. A 14-inch hole, 8ft. deep in hard rock in the open air, was charged with 4ft. 6in. of powder. This shot was considered very successful, for although not much rock fell, an enormous bulk was loosened, which was readily brought down with a small blast of ordinary powder placed in the rent. Experiments have since been made in various collieries to test the capabilities of this powder in the working of coal, and the results have been exceedingly satisfactory, and have fully borne out the expectations formed. Experiments in the copper mines of Cornwall have also given similar results.

The author could give numerous other examples of trials with Neumeyer's powder, which fully sustain its reputation as a blasting material; but enough has been said for the present purpose. He has dwelt at some length upon the merits of this material, because it appears to be the only powder which has proved in every way superior to gun-powder for blasting, and which really embodies comparative safety coupled with greater energy than the ordinary powder. But although so promising in its character, it has not come into practical use in England. An enterprising gentleman, Mr. E. H. Newby, to whom its introduction in our country is due, devoted a considerable amount of time and money in the endeavour to render it a commercial success. In this, however, he appears to have failed, although it is to be hoped such an admirable substitute for gunpowder, that as this material appears to be, may yet find its way into practice. In Germany, the author believes it still continues to be extensively believes it still continues to be extensively manufactured and used.

(To be continued.)

# ON THE CLIMATE OF NORWAY.\*

SEND the first results of my investigations relative to the climate of Southern Norway observations embrace seven years for the stations at Christiansund, Aalesund, Skudesnes, Mandal, and Sandesund; thirty years for the Astronomical Observatory at Christiania; three years for the station at Dovre; and one year for the Meteorological Institute at Christiania. numbers expressing the normal temperature at the different hours of observation for months and stations have been determined. The long series of the Christiania Observatory has enabled me to correct the means of the seven and three years' at the other stations, and thus to render them comparable, as if they were the results of a series of thirty years.

The hourly or two-hourly observations already taken, and which will be continued at certain stations, not yet being completely calculated. I have only been able to determine the daily means

approximately. In this determination I have used the Sa.m. and Sp.m. observations. The daily mean is calculated from the mean of these two quantities, plus a constant. This constant, varying from month to month, has been approximately determined by an interpolation of the values for Christiania and Bergen. The corresponding values for these two places agree with each other in a very satisfactory manner through all the months of the year, and I therefore regard the values of the mean temperature, given below, as very near the truth. As the amount of the corrections to be applied to the mean of 8a.m. and 8p.m. may be interesting to meteorologists, they are given in the following table:-

MEAN DAILY TEMPERATURE =  $\frac{1}{2}(8a.m. + 8p.m.) +$ A Correction. (F.)

	C-	ORRECT	ons.
Fo	r Christiania.		For Bergen.
	Deg.		Deg.
January	+~0.47	•••	+~0.32
February	+ 1.37	•••	+ 0.36
March	+1.55	•••	+0.52
April	+ 0.67		+ 0.25
Мау	-0.36	•••	-0.18
June	- 0.54		— 0·31
July	<b>— 0</b> ·05	•••	+ 0.04
August	+ 0.20		+0.20
September	+ 0.92	•••	+0.32
October	+ 0.86		$\pm 0.29$
November	+ 0.72		+ 0.13
December	+ 0.32	•••	+ 0.13

The effect of the greater diurnal range at Christiania is seen in these numbers. The numbers for Bergen hold good for all the west coast.

The following table contains—first, the monthly temperatures at the different stations; second, the mean annual temperature; third, the periods at which the temperature is equal to the yearly mean; fourth, the maxima and minima, together with their epochs; and, fifth, the yearly range of the temperature. Dovre is situated at a height of 2.064ft. above the sea: all the other stations are situated near the level of the sea.

# MEAN TEMPERATURE (FAHRENHEIT.)

alnathehd')	=	*	Ž	3	8	9	613	3	ç	2	27.0	\$ 5	25 Apr	170 ct	98	14 July	23	31 Jan	00
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Dore.	2	0 c	200	30.7	ş	23	20	7	7.75	210	17.6	32.6	Z Apr	13 Oct	25.1	20 July	14.5	12 Jan.	37.6
.bandreund.	i i	P Y	8	3	\$1.5	9	9	Ф 73	7	Ä	37.0	45.9		N Oct	1.19	25 July	27.5	S Feb.	31.0
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Christianla Institute.	5		, o	7	23	7	5.5	7	: :	ž	33	13:1	6 May	19 Oct	5.5	3 411)	32.9	2	22
	January	Narch	April			July	August	Beptember .	October	November	December	Annual	Enochs /	-	Maximum	Epocha	Minima	Epochs	Annual Range

The mean of the year at Christiania, determined by five observations daily, is only 0.05deg, higher than that given by the table. The accordance of the two methods of calculations for the different months is very satisfactory; it is only in the month of December that a difference of some tenths of a degree is found. The difference of 1 3deg, between the Astronomical Observatory of Christiania and the Meteorological Institute is owing to the latter being situated in the middle of the town. Although there is an open space on the northern side of the house, where the thermometers of the Institute are placed, the situation of the Observatory is much more open, and is more suitable for giving the true temperature of the air at the surface of the sur-rounding land. In drawing the isothermal lines from the above table, we find that the isotherms of Dove require but very small corrections. The isotherm of the year for 41deg. (Fahrenheit) goes from Throndhjems-Fiord towards Christiania; on Dove's chart it cuts the coast near Christiansund. The isotherm of January for 32deg, goes from the mouth of the Throndhjems-Fiord to Cape Sindesnes; according to Dove, it is much more to the west. The table shows the effect of the proximity of the Atlantic on the mean temperatures—on the annual ranges-on the epochs of the occurrence of the mean temperature, and of the maxima and minima temperatures.

The following table contains the mean values of the amount of rainfall (and melted snow) at the



<sup>\*</sup> Translated from a paper by Professor H. Mohn, in the "Bulletin de l'Association Scientifique de France," by Mr. J. STAUGHTON HARDING, F.M.S.

different stations. I have added those of Bergen, deduced from a series of seven years' continuous observations, from 1861 to 1867.

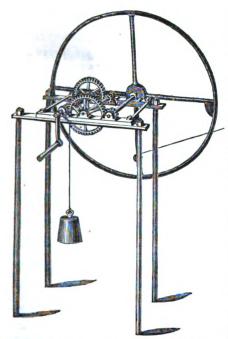
AMOUNT OF RAINFALL IN INCHES.

	Christian- sund.	Aalesund.	Bergen.	Skudesnes.	Mandal.	Sandesund.	Dovre.	Christiania Observatory.
January February March April May May June July August September October November	2.02 2.03 1.88 1.63 2.53 3.22 2.84 3.67 3.72	4·32 3·22 2·39 2·00 2·86 2·04 4·16 4·17 3·97 5·83 4·26	6·22 6·05 3·30 4·41 3·72 4·42 5·08 7·47 8·66 8·19 6·37	3·65 2·48 2·02 2·51 1·88 2·46 2·49 4·35 6·17 4·41 4·47	2·72 2·50 1·89 2·71 3·34 3·75 4·87 4·29 6·32	1·20 2·28 1·72 1·88 3·57 1·65 2·34	0.78 0.39 0.62 0.11 0.45 0.71 1.81 1.17 0.71 0.69 0.81	0.89 0.89 0.97 1.44 2.25 2.65 3.17 2.57
Annual Mean}	33.18	6·28 45·48	8·79 72·70	41.06	44.01	1·75 22·99	9.34	21.17

The maximum is at Bergen, on the west coast, where the mountains rise rapidly above the sea. The mountains at Skudesnes and Mandal are much lower. Aslesund and Christiansund are sheltered from the south winds by the Dovre Mountains. The Scandinavian Alps have their summit towards Aslesund and Christiansund are sheltered the west coast of Norway, and decline very gently towards Christiania and Sandesund, where the west winds are very dry.

## A SELF-ACTING PUNKAH.

THE services of the punkah-wallah—whose manual work in the barracks, hospitals, and private dwellings of India is often unsatisfactory as well as dear—are shortly to be superseded by a very ingenious piece of machinery, the invention of Lieutenant Turnbull, of the 6th Royals. This apparatus, which is shown in the accompanying cut, was recently exhibited at the United Service



Institution, and was approved of by several distinguished Indian officers, as well as by the engineers—civil and military—who saw it in operation.

The mechanism is simple, and its perfect noiselessness will be one of its chief recommendations, the faint ripple of the linen punkah being heard amid the profound silence of the wheels that move it to and fro. A dead weight turning a horizontal shaft gives the desired motion to a slender flywheel with four spokes, a slight jerk of the punkah being caused at each revolution by the plan of making one spoke heavier, at the end next the nave, than either of the other three. This peculiar action imitates, with admirable nicety of effect, the movement of the wrist when the punkah is worked by an attendant. There are 12,000 revolutions of the flywheel, and consequently as many forward pulls of the fan, in eight hours, and this statement will exemplify the great saving of manual labour which the machine accomplishes. It is said, on the authority of a general officer, that the cost of such labour for a month has been,

in the case of one regiment, more than £100. Portability is another of the valuable qualities of Mr. Turnbull's apparatus, which, being taken to pieces, will fit into a shallow box 2ft. square. Heat vieing with that of the tropics is not unknown even in this country, and the adaptation of the self-acting punkah to the wards of our home infirmaries would be no bad idea.

### VERTICAL DRILLING MACHINE.\*

VERTICAL DRILLING MACHINE.

H AVING referred to some of the uses to which the "engine lathe" and the "planing machine" may be applied outside of their legitimate work, let me now mention some of the purposes to which the "upright" or vertical drilling machine may be applied, beside that of simply drilling holes. This machine is constructed in various ways, according to the dimensions and character of the work to be operated upon. The most primitive machine may be denominated the post drill. It consists of a simple casting similar to that of a headstock of a turning lathe fitted to a post in the shop. The spindle is fitted to slide vertically in the boxes, and to rotate at the same time, the rotary motion being given by a pair of bevels and cone pulleys in the usual way, and the vertical motion by a rack and pinion and chain wheel, or a rope is often used instead of a chain. The article to be drilled rests upon the floor, or upon a movable bench. drilled rests upon the floor, or upon a movable bench.

There is another kind of drilling machine which
may be designated the "pedestal drill." This has
a cast-iron pedestal with a broad base, or several legs, resting upon the floor, the pedestal, or body, extending to the ceiling above. The spindle and machinery are mounted upon this pedestal; the heavy machines have a back gear and self feed; they have also an adjustable table, which may be sw ng saide if necessary. This machine has been brought to great perfection; a fine specimen may be seen in the new shop of the Boston and Providence Railway Company in Roxbury.

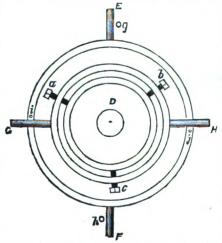
A very useful vertical and drilling machine is that

Railway Company in Roxbury.

A very useful vertical and drilling machine is that of the suspension kind, with a cast-iron table firmly attached to its base. This machine is suspended from the ceiling overhead, having no connection whatever with the floor, thus giving a clear field upon the floor for articles of every size and dimensions, the table at the same time accommodating articles of small dimensions and more accurate work. It is the duty of the makers of these machines to see that the tables are fixed perfectly at right angles with the spindles, and that the tables are so attached that they can be easily swung aside when not in use. A good vertical drilling machine, with a table accurately attached, may be used for boring the hubs of wheels, cutting key ways, chucking tapping nuts, &c., with much facility. For boring and cutting key ways, it is necessary that the centre hole in the table should be bushed with a hardened steel thimble, for a permanent bearing for the boring spindle; the spindle should pass through a leather washer before it enters the steel bush, in order to exclude dust from the bush. The article to be bored may be accurately centred on the table by the placing a "sweep," or arm, on the spindles, and let it revolve close to the rim or edge of the article. When the article is centred, it must be firmly clamped to the table, then the hole may be bored, and a key way, if necessary, may be cut.

In chucking, it is not necessary to confine the article to the table, but simply to hold it from

In chucking, it is not necessary to confine the article to the table, but simply to hold it from revolving; a very simple and efficient chuck for holding articles for this purpose may be made as follows:—Provide two circular pieces of iron, the smallest of which must be large enough to embrace the largest article to be chucked, and the largest some two inches larger than this. (See diagram.)



The smaller ring is provided with three set screws, a b c, for holding the article D, to be operated

" "F. G. W." in the American "Railway Times."

Each of the rings has two fingers, E F G H, projecting from its periphery exactly opposite each other. The fingers of the external ring rest against projecting from its periphery exactly opposite each other. The fingers of the external ring rest against two pins g h in the drill table. These pins must be placed in a line with the centre of the table. The fingers (G H) of the inner ring rest against two pins i j in the rim of the external ring; these pins must be placed opposite each other, and at right angles with the fingers of the external ring. The fingers (i j) of the inner ring should be placed so as not to rest upon the outer ring when the inner ring rests upon the table. This chuck is self-adjusting, and distributes the stress equally upon each of the four pins g h and i j. The conditions for perfect work with this chuck are, that the article to be chucked must be accurately centred, either by the moulder or by means of dividers and a small drill, and that the "reamer" must run true in the spindle. Common flat drills may be used to bring the hole to nearly the size of the finishing tool or "reamer."

### M'LINTOCK'S METALLIC PACKING.

HE importance of a good packing is recognized I wherever the power of steam is utilized, and we think the piston-rod packing, illustrated in the annexed cut, may fairly lay claim to the title of



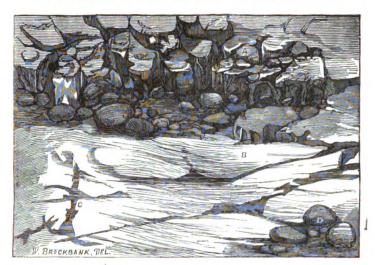
"good." It is the invention of Mr. John M·Lintock, and is now being introduced by Mr. F. Tuxford, of 110, Cannon-street, City. It consists " good." of rings made of alternate layers of linen and india-rubber cement, the whole being compressed in a powerful apparatus. The rings are lined with copper firmly united by claws with the linen. The rings are dense, elastic, and possess many of the best characteristics of a good packing. We are informed that they will last five months in loco motive and twelve to eighteen months in stationary engine work, and we see no reason to doubt the assertion. We have seen testimonials from various eminent firms, which speak to the high character of this packing.

# NITROUS OXIDE GAS TO PREVENT PAIN.

A VERY valuable report (published by Wyman and Sons, of Great Queen-street), has been made after numerous carefully conducted experiments on the human subject and on animals. It states,—1st, that the pure gas, so administered as to preclude the inhaling of any atmospheric air with it, is a powerful anæsthetic—more rapid in its action, although more evanescent in its effects, than chloroform and the other anæsthetics now in general use; 2nd that if its administration were pushed beyond a 2nd, that if its administration were pushed beyond a 2nd, that if its administration were pushed beyond a certain point, it is capable of producing death; but 3rd, that even when death appeared most imminent from its use, the allowing the animal to breathe fresh air, in most cases, brought it rapidly round. It must not, however, be imagined from this that nitrous oxide is an anæsthetic suitable for relieving pain generally. It is suited only to dental and surgical operations which last for, at most, a very few minutes. Its advantages and disadvantages are thus summed generally. It is suited only to dental and surgical operations which last for, at most, a very few minutes. Its advantages and disadvantages are thus summed up in the report before us:—Advantages.—I. The rapidity of its action in producing anæsthesia, the time required for this being from 63 to 81 seconds. 2. The rapidity with which patients recover from its effects, as an anæsthetic; the time required for this being, according to the same table, from 100 to 120 seconds; and patients generally recovering so completely, as well as quickly, as to be able to walk, speak correctly, and write with a steady hand within four minutes from the commencement of inhalation. 3. It is more agreeable to most patients, being, when pure, quite tasteless. 4. It is less irritating to the air passages, coughing or struggling for free respiration being rarely witnessed after its use, except in cases of very nervous persons. 5. The comparative freedom from nausea and vomiting after its use, the average number of cases where actual vomiting has occurred being under 1 per cent. 6. The absence, as a general rule (after the recovery of complete consciousness), of giddiness, headache, and many other unpleasant effects, which are well known to follow the use of chloroform and other anæsthetics. Disadvantages.—I. Its unsuitableness for long operations, owing to the shortness of its anæsthetic effects. 2. Its unsuitableness (or at any rate ineligibility) for operations followed by much smarting and pain, for the same reason. 3. Where very delicate operations have to be performed, the inconvenience



# HEMATITE ORE DEPOSIT.



the operator arising from the muscular twitchings hich often occur from its use. 4. This gas is more oublesome to administer, and requires more emplicated and cumbrous apparatus than other mesthetics do. 5. The inconvenience arising from the trouble of transporting this gas, as compared with the appearance of the expensiveness, and the ther anæsthetics. 6. Its expensiveness, and the ifficulty of procuring it in a pure and efficient state or use at all times, if wanted on an emergency.—Scientific Opinion."

'HE HEMATITE IRON ORE DEPOSITS OF WHITEHAVEN: NOTES ON THE ALDBY LIMESTONE, CLEATOR MOOR.\*

BY W. BROCKBANK, F.G.S.

THE mountain limestone of the Cleator district forms an assessment forms an escarpment to the valley of the iver Ehen, from Egremont round the base of Dent lell, towards Cockermouth. It rests upon the old lay slate of Skiddaw and Dent, and is the outcrop if the Whitehaven coal field. It contains most ctensive and valuable deposits of hematite iron re, and is therefore an interesting subject for tudy in any aspect which will throw light upon a question of the origin and deposition of the any aspect which will throw light upon be question of the origin and deposition of that aluable mineral. The general character of the ematite deposits in this limestone was briefly setched by the writer in his remarks to this ociety, December 10, 1867, and which were rinted in the Proceedings, p. 59-61. The object f the present communication is briefly to describe he section of mountain limestone exposed in the uarries of the Whitehaven Hematite Iron Comany, at Aldby, on Cleator Moor, and its surface as ffected by diluvial and glacial action—believing hat both these points have a considerable bearing pon the subject of the occurrence of hematite ron ores.

About an acre of the surface of the limestone is t present exposed, having been cleared of from ift. to 8ft. of the till or boulder clay which covered This clay is of the character well known to us a the neighbourhood of Manchester, having oulders of porphyry, granite, greenstone, clay, late, and the other well known characteristics of he drift, and is believed by the writer to have lad the same or a similar origin, viz., from the nountains above Ravenglass, near Wastwater and Devoke Water. The easterly side of this large imestone surface bears a striking resemblance to the tops of some of the Yorkshire hills—such as he Moughton Fell, the flanks of Ingleborough, or the mountain limestone summits near Grange in Cartmel-being deeply fissured in every direction. On these fissures being emptied of the till by which they have been filled, they are found to contain the roots of ferns or other mountain plants still attached to the crevices of the rocks, just as we see similar clefts abounding in plants on our mountain tops in this day.

About half the area is thus fissured, and when

About half the area is thus insured, and when the crevices are not filled with till they are found to contain hematite ore. Most of them have, however, been much waterworn, being andercut and hollowed out into basins and arches of every form. Passing westwards across the cleared surface, we come to a most marked illustration of

\* Read before the Manchester Literary and Philosophical Society.

glacial action. The projecting masses have all been cut away, and the surface, for some half acre one cut away, and the surface, for some half acre in extent, planed smooth by ice, the floor being evenly cut into long undulations, deeply scratched in long clearly marked striations. The markings run nearly S. to N., and as the boulders are of greenstone, porphyry, granite, syenite, and clay slate, of similar nature to the rocks now existing in the granitic and synetic district of Birker Moor, about Devoke Water and Wastwater, there is little doubt that they came from that locality, lying, as it does, nearly south, in the direction indicated by he striations. Several veins of hematite ore are exposed upon this polished surface, as shown in the accompanying sketch of limestone surface at Aldby Quarry, in which A is the fissured limestone after removing the till; B, eroded surface; C, vein ore; D, boulders of granite, syenite, &c.
The quarry presents a very fine section of lime-

stone rock from its eastern escarpments towards the Ehen valley to its junction with the lower coal measures, at the westerly corner of the quarty, and from 50ft, to 70ft, in height. The limestone beds are much contorted and intersected by faults showing a very disturbed and irregular stratifica-, tion. The easterly escarpment, sloping towards the river Ehen, is made up of a breccia of hematite ore and limestone, in large irregular blocks, cemented together into a compact mass. It was so rich with ore at the surface, as to be worth working, and an open quarry was commenced, and a large quantity removed, but the impurity of the product soon led to its abandonment. It is very evident that this face of limestone was at one period covered with a large deposit of hematite ore, since denuded. Wherever a fault or fissure occurs in the face of the quarry it is filled with ore, evidently from above. Many of these veins of ore have appeared so rich as to induce the miners to follow them by shafts; but no large pockets rewarded the search, the main limestone eing too regular and compact to admit of any large masses. It is, however, quite evident that if any large cavities had occurred, they would have been filled in from above with iron ore, as is the case at the neighbouring mines of Gutterby, Bigrigg, Parkside, &c.

We have, therefore, evidence in this quarry First, of a deposition of hematite iron ore by water, after the limestone had been uplifted into its present position, or nearly so; and, secondly, the denuding action of running water, and afterwards of the erosion by drift ice, probably coeval with our own boulder drift, and from the same centre of glacial action. Under more favourable circumstances, these powerful agents might have been instrumental in depositing large masses of hematite ore, as there is abundant evidence that this has tite ore, as there is abundant evidence that this has been the case within a very short distance from Aldby—large masses of iron ore having been worked by open quarry, lying in exactly similar positions as the small crevice-filled cavities first described. It is also very evident that these denuding agents have likewise been instrumental in removing large quantities of ore previously de-posited, and the outliers of limestone capping isolated prominences in this neighbourhood, testify to the great extent of denudation which we may reasonably suppose took place at the period indicated by the eroded surface of the Aldby limestone.

bank, states that the chief portion of the vegetation referred to in the preceding paper, consists of dark-coloured fragments of the stems of a dicotyledonous plant which seem to have been broken sharply off while growing in situ. They have the general appearance of rotten sticks, and in their fresh condition are very soft and friable, yielding readily to the knife, but with exposure to the air they dry and become much harder. They appear to have belonged to a shrubby plant of no great size, the stems of which would range between half and three-quarters of an inch in diameter. internal portion of the stems has almost entirely disappeared, and in the few fragments examined, there are no traces of any woody layers, medullary rays, or central pith. The portions preserved rays, or central pith. The portions preserved consist of true bark, which is made up of two layers:—an exterior layer, or periderm, which is in a good state of preservation; and an interior fibrous portion, or liber, made up of short rectangular cells, which form layers of considerable thickness.

All the woody fragments examined belonged to aerial portions of the plant, but there are no re-mains of the leaves borne by these stems, and it would be very desirable that they should be sought for in the lower portion of the overlying clay, as they would be very helpful towards determining the species. If a conjecture might be hazarded, from the nature of the fragments examined, as to the particular plant of which they formed a part, I should refer them to some species of Betula (birch). There was a single piece of woody matter looking like the rhizome of a fern, but the presence of scalariform tissue failed to be detected in it, and the fragment was too small to draw a definite conclusion from. Intermixed with the stems referred to above are the leaves of some cryptogamous plant, like those of a hypnum, and formed of square shaped transparent cells; and embedded in the earthy portions which make up the remainder of the mass are a few well preserved thread-like roots, which are white in colour, cylindrical in shape, only slightly branched, and containing well defined vessels.

# MANCHESTER BOILER ASSOCIATION. CHIEF ENGINEER'S MONTHLY REPORT.

THE last ordinary monthly meeting of the executive committee of this Itive committee of this Association was near at the offices, 41, Corporation-street, Manchester, on Tuesday, January 12, William Fairbairn, Esq., C.E., F.R.S., LL.D., &c., president, in the chair, then Mr. L. E. Fletcher, chief engineer, presented his report, of which the following is an abstract: tive committee of this Association was held During the past month 373 visits of inspection have been made, and 800 boilers examined. Of this number of boiler examinations, 574 have been external, 14 internal, 8 in the flues, and 204 entire, while in addition 9 boilers have been tested by hydraulic pressure. In these boilers 125 defects have been discovered, 11 of them being dangerous. Furnaces out of shape, 3-2 dangerous; fractures, 15; blistered plates, 7-1 dangerous; internal corrosion, 19-2 dangerous; external corrosion, 17 —1 dangerous; internal grooving, 17; external grooving, 3; feed apparatus out of order, 4; water gauges out of order, 6—1 dangerous; blowout apparatus out of order, 12; safety valves out of order, 3; pressure gauges out of order, 7; boilers without glass water gauges, 4-dangerous; without pressure gauges, 1; without blow-out apparatus, 2; without feed back pressure valves, 5.

On the present occasion, I have two explosions to report, by which four persons were killed and three others injured. Neither of these explosions occurred to boilers under the inspection of this Association. The following is the statement of explosions from November 21, 1868, to December 31, 1868, inclusive:—December 2, vertical (internally fired), 1 injured. December 11, vertical marine (internally fired), 4 killed, 2 injured. Total, 4 killed; 3 injured.

Mr. Fletcher reports that another feed water heater or economizer has exploded, which makes the third that has recently failed in this way. This is something quite novel and surprising, as this is something quite novel and surprising, as this apparatus had previously been considered as incapable of explosion. Since these economizers prove of so much service, and are so generally adopted, the question of their safety is one of general importance. The explosion referred to occurred in France, on Saturday, December 26, and by it three persons were killed and others injured. The distance from Manchester at which this took place, combined with the pressure of this took place, combined with the pressure of Mr. C. Bailey, in a letter addressed to Mr. Brock-lother duties, prevented a personal examination,



SMOKE PREVENTION RETURN FROM SEPTEMBER 7 TO DECEMBER 31, 1868.

			FIRE DOOR	R.	FIRE	GRA	TE.	CON	COAL SUMPT	ion.	1	IOKE PER IOUR.	
Index No. of Visits.	Description of Works.	No. of Bollers at Work.	Description.	Area of Perforation perSq. Foot of Crute.	Length.	Thickness of Bar.	Width of Air Space between Bars.	Gross Consumption per Weok in Tons.	Consumption per Boiler per Weck in Tons.	Lbs. of Coal Burnt per Sq. Foot of Fire Grate per Hour.	Minutes of Very Light.		Minutes of Black.
1	Dyers	4	Perforated	2.1	Ft. In. 6-0 7-0	ria.siariariariariaria 1	1 1 1	Tons.	Tons.	14.94	4	0	0
2	Weavers	1	Perforated	0.1	(6-8 4-6	36043	1	12	12.0	21.33	fnt.	2	0
3	Spinners	3	Square } Opening	2.5	{6-0 {5-6	3	4 full 5–16	54	18.0	20.79	4	1	0
4	Spinners	3	Perforated		`6-0	100	0-10	46	15.3	14.50	18	1	3
5 6	Spinners  Dyers and	8	Blind		6-0 Ft. Ft.	11/4	8	172.5	21.5	23.00	faint	pu	ffs.
-	Bleachers	19	Blind		5 to 7	vari	ous.	340	17.9	20.70	8	3	0
7	Spinners	4	Slightly Perforated		\ \frac{7-0}{16-0}	7878	1 4	- 65	16.2	16.28	17	0	0
8	Spinners	4	Perforated	2.0	6-0	į	5-16		15.0	17.77	12	4	0
9	Colour Makers .	1	Perforated	0.3	3-7	1	1	6.1	6.1	23.33	7	3	0
10 11	Spinners Engineers	4	Perforated Perforated	1·4 0·3	7-0 7-0	1 3	37 7	69·8 61·2	17·4 15·3	17·47 13·96	$\frac{9}{52}$	8 8	2 0
12	Spinners	4	Perforated	0.3	6-0	not	tkn.	90.0	22.5	23.80	24	2	0
13	Chemical } Works	4	Blind		6-6 6-6 5-0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	54.0	13.5	16.14	6	0	0

which would otherwise have been made, on account of the importance of the question, but Mr. Fletcher expects shortly to be in possession of the details, which shall be reported as soon as possible. In the meantime, the suggestions given in the report for October last, when referring to the recent economizer explosion, may be repeated, viz., that the following precautions should be adopted for guarding against similar disaster, whether from steam or gas. In the first place, the safety valves on the economizers should be at once examined to see whether they are in working order, while it may be pointed out that a safety valve of external may be pointed out that a safety valve of external dead weight pendulous construction, without wing or spindle, similar to those in use on many of the members' boilers, is less likely to become gagged by incrustation than the ordinary lever safety valves boxed in out of sight, which are generally used; while, in the second place, the flues should be examined to see that there are no void chambers in which gas can accumulate, and care should be taken when either the economizer or bye-flue is shut off, that the damper at the entrance be closed as well as that at the chimney.

The attention called to the subject of smoke prevention, by the late experiments, conducted on this subject at Wigan, by the South Lancashire and Cheshire coal owners, and fully reported by us, has led the Manchester Boiler Association to add to its staff the trained stoker, who was engaged throughout the whole of the experiments just referred to, the object being that he might visit the works of the members, and assist their stokers in introducing a more smokeless system of firing. He has now been engaged in this way for about three months, and the table above may be of interest as showing the results arrived at.

From the above table it will be seen that the Association's stoker has visited thirteen of the Association's stoker has visited thirteen of the members' works, and operated upon sixty-three boilers, consuming per week 1,085 tons in the gross, and on an average, 17½ tons per boiler; while the main rate of combustion per square foot of fire grate per hour has been 18¾1b. Under these conditions, the average result has been realized of about 12½ minutes of very light smoke, 21 minutes of brown, and one-third of a minute of black per hour, which is certainly very much below the amount emitted from chimneys generally. The conditions under which the trials were made were not by any means the most favourable for success. In some cases, the doors had no perforations; in many, the area was too limited; while some of the firegrates were 7ft. in length, which is too long. While no doubt more remains to be done too long. While no doubt more remains to be done to complete this movement, yet it has been seen that much can be accomplished by careful firing alone, coupled with the admission of a little air at the firedoor, which shows the importance of having all firedoors fitted with suitable sliding grids on the outside, and perforated box baffle-plates on the inside.

# Correspondence.

# HYDRAULIC BUFFERS.

TO THE EDITOR OF THE "MECHANICS MAGAZINE."

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—Your magazine of November 6, 1868, contains an interesting suggestion by Colonel Clerk, R.A. for the employment of hydraulic buffers on railway trains; and my experience with water cylinders induces me to believe that the suggestion is well worthy of an experimental trial, and that the result would be found satisfactory. It is hopeless to expect that any buffer can be found which will entirely remove the dire effects of a railway collision, but I am convinced that the effects of collisions would be much lessened by the employment of hydraulic buffers; while many of those accidents to passengers in railway stations, caused by the recoil of spring buffers, would not occur. The idea to me is not a new one for I remember well the ingenious little model, shown would not occur. The idea to me is not a new one for I remember well the ingenious little model, shown to me by Mr. John Hanson, of Huddersfield, also the to me by Mr. John Hanson, of Huddersfield, also the circumstances attending it, as detailed by him in your magazine of November 20, 1868. I had that model several years in my possession, made many experiments with it, and satisfied myself that the idea was a good one. In thinking over the matter and its reference to Mr. Hauson, it brought to my mind a thing which is not generally known, viz., that the "needle gun" was invented by him in England. Proof thereof may be found in Golden and Hauson's natural, dated November 1, 1841.—1 am Sir yours patent, dated November 1, 1841.—I am Sir, yours, &c., C. E. Amos.

5, Cedars-road, Clapham-common, S. January 29.

## NICKEL PLATING.

NICKEL PLATING.

SIR,—I should feel much obliged if you, or any one of the readers of your paper, can give me, through the medium of your journal, information, or state where I can obtain such information, on the subject of nickel plating. Is it a new or old invention? If the former, whether it is patented, and number of patent? Is the nickel, after plating, subject to oxidization. Any further information on the subject will be thankfully received.—I am, Sir, yours, &c.,

F. O.

the subject will be thankfully received.—I am, Sir, yours, &c.,

London, February 1.

[There is no patented process for depositing nickel on other metals now in existence, or ever has been, that we are aware of. We have seen the nickel deposited from various solutions. For example, from a solution of nickel cyanide in potassium cyanide; from an aqueous solution of nickel chloride, and from an aqueous solution of nickel sulphate. The cyanide solution gives the best coloured metal. and from an aqueous solution of nickel sulphate. The cyanide solution gives the best coloured metal, but it works badly. The sulphate solution works the best; nickel does not oxidize either in dry or damp air; nor does sulphuric acid or hydrochloric acid act readily upon it. As to the proper solution to be used, that depends entirely on the metal to be coated. Nickel, when deposited has much the appearance of platinum.—ED. M. M.]

the firebars being reduced from 9in. by 4in. to 6in. by 2½in., so as to work in the tube. It is found that these bars burn rapidly, and do not last nearly so long as those used in Juckes' system applied to eggend boilers, and which are 9in. by 4in. I would thank you to say whether you think the cause of burning is through reducing the size of the firebars, or because of the returning firebar coming so near the upper firebars. The air having to pass through the returning bars becomes increased in temperature before reaching the fire.—I am, Sir, yours, &c., Wigan, Feb. 3. Enquirem, M. [The result of which our correspondent complains is doubtless due to both the causes mentioned—viz., the reduction of the bars and the increase of temperature. Besides, this application of Juckes' system is hardly a fair test of the principle, to which no blame can attach if failure occurs under such conditions.—ED. M. M.] the firebars being reduced from 9in, by 4in, to 6in.

### SUGAR AND STARCH MACHINERY.

SUGAR AND STARWH MAN HYBERT.

SIR,—Can you, or any of your readers, oblige mo with any information on the following points:—

1. Who are the manufacturers of Wilde's patent for purifying or crystallizing sugar by electricity?

2. Who are the manufacturers of machinery for making starch from notatees and corn?—I shall be making starch from potatoes and corn? I shall be much obliged if you can help me in the matter.—
I am, Sir, yours, &c., ENQUIRER.

### TOBACCO MACHINERY.

TOBACCO MACHINERY.

SIR,—Referring to the notice of machinery at Messrs. Wishart and Lloyd's, in your last impression, allow me to state that the manufactory was laid out and fitted according to my directions, and under my immediate supervision as consulting engineer for Messrs. Wishart and Lloyd, and that I superintended the arrangement of the machinery, for the successful carrying out of which so much credit is due to the makers.—I am, Sir, yours, &c., EDWARD FIELD. EDWARD FIELD.

Chandos Chambers, Adelphi.

TO CORRESPONDENTS.
THE MECHANICS MAGAZINE is sent post-free to subscribers
of £1 is. 8d. yearly, or 10s. 10d. half-yearly payable in
advance.

advance.

All literary communications should be addressed to the Editor of the Mechanics Magazins. Letters relating to the advertising and publishing departments should be advertising and publishing departments should be advertised to the publisher, Mr. R. Smiles, Mechanics' Magazins Office, 196, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, ED, M. M.

Advertisements are inserted in the Mechanics' Magazins, or 4d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise-Special arrangements made for large advertise-

RECEIVED.—C. P. C.—W. and I. K.—B. L. F. P.—E. C.—R. S.—C. E. A.—A. N.—W. F. B.—J. T.—J. B. H.—F. O.—J. H. B.—R. D.—G. and B.—T. C.—S. K. M.—R. M.—J. N.—P. O.—R. I.—E. F. B.—G. E. P.—H. G.—J. M.—A. B.—W. P. M.—G. S.—A. G.—L. C.—W. L.—G. F.—E. M.—F. C.—I. E. F.—J. B. T.—R. W.—J. N.—B. J.—G. P. S.—H. W. R.—E. P.—E. F.—R. M.—T. F. W.—H. D. and Co.—B. H.

### Meetings tor the Bleek.

TUES.—Royal Institution.—Mr. Westmacott, on "Fine Art," at 3 p.m.

The Institution of Civil Engineers.—Discussion on "The Mauritius Railways, Midland Line;" and Professor Ansted, F.R.S., on "The Lagoons and Marshes of Certain Parts of the Shores of the Mediterranean," at 8 p.m.

WED.—Civil and Mechanical Engineers' Society.—Mr. G. H. Royce on "Our Railways, their Condition and Prospects," at 8 p.m.

THURS.—Royal Institution.—Or. M. Foster on "Involuntary Movements of Animals," at 3 p.m.

Fat.—Royal Institution.—Colonel Jervois on "The Coast Defences of England," at 8 p.m.

Royal United Service Institution.—Major C. Adams, Professor of Military History, Royal Military College, on "The Italian Campaign of 1866," at 3 p.m.

SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

THE MANUFACTURE OF WATCHES AND CLOCKS.—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons acid act readily upon it. As to the proper solution to be used, that depends entirely on the metal to be used, that depends entirely on the metal to be conted. Nickel, when deposited, has much the appearance of platinum.—Ed. M. M.]

SMOKE CONSUMPTION.

SIR,—The subject of rotary furnaces, applied to tube boilers for consuming smoke, &c., is at present occupying considerable attention in this town.

Juckos' furnace has been applied to a boiler tube it to the notice of the intending purchasor.—| Advr. |



# Habal, Military, and Gunnery Items.

THE American steamboat "Clyde" was wrecked in Red River on the night of the 12th of January. Six persons were killed and 25 injured by the disaster.

THE last new plaything of the French War Office is a kind of infernal machine, which in one minute's time can propel 1,500 bullets to a distance of 1,200 metres (about 1,300 yards).

WE—"Broad Arrow"—believe that notwithstanding the great reduction contemplated in the number of subaltern offices, those gentlemen who have actually passed their examination will shortly be provided with commissions. As some anxiety has been expressed regarding the disposal of these gentlemen, we are glad to be able to make this announcement.

Some of the large shipbuilders at Poplar have received orders for the construction of vessels for the Turkish and other governments. Messrs. Wigram are about to lay down two passenger steam vessels for the Portsmouth and Ryde Steam Packet Company, to be ready for traffic next summer. They are to be named respectively the "Duke of Edinburgh" and the "Princess Alice."

A MEMORANDUM has been issued for the information of officers and men employed in the dockyards, who are likely in future to become candidates for examination for promotion, that a much larger acquaintance than heretofore with iron shipbuilding and with the properties and peculiarities of steel plates and rivets will then be required of them. The Chief Constructor's new work will prove of great assistance to these candidates.

A DESPATCH from Fortress Monroe states that on the 13th of January at that place General Barry presented to Captain Robert Creighton, formerly master of the British ship "Three Bells," a superb gold medal, voted him by Congress for his gallant services in rescuing the survivors of the wrecked American steamer "San Francisco," some time ago. The presentation was made by express instructions of the War Department. Captain Creighton now commands the West India Royal mail steamer "Venezuela."

THE "United Service Gazette," touching on naval economy, says that matters are really becoming serious, and Mr. Childers seems to be as much in earnest as the player who, as Mr. Dickens describes, went so entirely into his part that in playing "Othello" he blacked himself all over. The Admiralty in visiting Chatham Dockyard had no guard of honour, and went to the yard in cabs. Our correspondent (though we are constrained to confess that, on this one occasion, to speak clearly, we do not believe him), says that all five went in one cab, and that a lively discussion with the driver on the subject of an extra sixpence took place at the Dockyard gates.

We have to record the death of an old man-of-war's-man, who was perhaps the last surviving seaman who took part in the brilliant engagements of St. Vincent and the Nile. The old man, who was named Stephen Watler, expired on Friday, the 22nd ult., at his lodgings in Margate. He was in his 97th year, he having been born in July, 1772. He served under Lord Howe in the memorable action of 1794, for taking part in which engagement he was rewarded with a medal, which he retained up to the day of his death. He also served under Lord Nelson, and took part in the naval engagement of the Nile as gunner's mate on board the "Barfleur."

gunner's mate on board the "Barfleur."

[ON Saturday last, the tank vessel "Dispatch," built for H.M. Government, by Messrs. Maudslay, Field, and Son, was successfully launched from their works at East Greenwich. Her dimensions are:—Length between perpendiculars, 115ft.; breadth, extreme, 22ft.; depth. 10ft.; builder's measurement, 250 tons; and engines of 40-horse power. She is destined for the service of the Royal William Victualling-yard at Devonport, for carrying fresh water and provisions to the fleet. The tanks are capable of carrying 150 tons of water; the hull is divided by seven bulkheads into eight compartments; the auxiliary steam engine and pump in the engine-room are so arranged as to draw from either of the tanks independently, and the ship's pumps are also arranged to draw from the tanks and from each of the compartments.

The states of the island of Jersey have in contemplation the supplying of a very much needed aid for safe navigation on a dangerous part of the south-west coast of the island—known as the Corbierre Rocks—by the erection of a lighthouse thereon. By this means vessels will be enabled safely to pass the treacherous spot, which has been the cause of the destruction of many a fine vessel; and the mail packet will often be enabled to reach Jersey at night time, when detained by stormy weather, instead of being obliged to stay all night at Guernsey, as they are now frequently compelled to do, to avoid the dangers of approaching the island without the muchneeded light to indicate the vicinity of the dreaded

Corbierre. The states only wait for the consent of the Trinity House, and an undertaking that the light shall be entirely under the States' control.

THE "Wellesley," training ship, is now illuminated with gas. It is conveyed under water by means of elastic tubes. There was no reason why it should not have been manufactured on board, as is to be done in H.M.S. "Monarch," but the gas being within 200ft., it was thought best to take it from the shore. Lighting ships with gas appears to be no novelty, inasmuch as more than forty years since, the steamer "Duke of York," which was then chartered by Government, and employed in carrying mails and passengers between London and Portugal, Spain and the Mediterranean, was lighted with gas. It was not made on board, as in the case of the "Monarch," but kept in iron bottles, one of which was screwed on to the main, and when the gas contained in it was consumed, a fresh bottle was substituted. The "Duke of York" was afterwards purchased into the Royal navy, re-named the "Messenger," and is, or very lately was, a coal depot off Woolwich.

# Miscellanea.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending January 30, was 5,103. Total number since the opening of the Museum, free daily (May 12, 1858), 1409.657

In a cave at Rock Island, Illinois, the statue of an Indian maiden has been discovered. It has a solid copper pedestal, 71t. high, and obelisk of solid brass. Other Indian curiosities have been lately discovered in the same vicinity.

On the night of January 13 there was an extensive fire in Philadelphia, burning one of the finest blocks of warchouses in the city, and involving a loss of 1,000,000 dollars. Two young men perished in the flames.

At the meeting of the Society of Engineeers, held on the 1st inst., Mr. F. W. Bryant, President, in the chair, the following candidates were balloted for and duly elected Associates:—Messrs. C. C. Gibbons, of 35, Great George-street, and Alfred Rubery, of 12, Dowgate-hill.

The foreign trade of the Colony of Victoria continues to show an increase. In the first eleven months of 1868 the imports amounted in value to £11,391,938, an increase of £1,416,503 over the corresponding period of 1867. The exports amounted to £12,814,750, an increase of £2,625,211.

At a meeting of the Carlisle Angling Association, held yesterday week, it was stated by the committee in their report that the spawning beds in the river Eden are "literally crowded with salmon," and the oldest watchers on the river never saw so many salmon in the river as there are this year. Similar reports come from the Nith, in Dumfriesshire.

THE Government of the Emperor Alexander has raised Kiew, chief town of the province of Little Russia, to the rank of third capital of the empire, placing it next to St. Petersburg and Moscow. In consequence of this resolution an Imperial palace is to be constructed there without delay; and the Minister of Finance has received orders to place at the disposal of the architects the necessary sums.

WE understand that the new Blackfriars Bridge is definitely to be opened on the 24th of next May. There is a peculiar fitness about the choice of the date. On the 24th of next May her Majesty will complete her 50th year, and, by a curious coincidence, it also happens that that day will also be exactly the hundredth anniversary since the opening of the old Blackfriars Bridge in 1769.

THE number of visitors to the South Kensington Museum during the week ending January 30, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 15,791; Meyrick and other galleries, 3,352; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 2,050; Meyrick and other galleries, 324; total—21,517. Average of corresponding week in former years, 10,184. Total from opening of Museum—8,116,885.

THE Society of the Friends of the Arts of the Moselle have decided that an exhibition shall take place at Metz this year. It is to open on May 1, and to close on the 20th of the same month, in order that the artists exhibiting there may have the opportunity of sending their works to the Strasburg exhibition, which opens soon afterwards. The Metz exhibition is open to artists of all nations, and works are to be sent in to the Hotel de Ville of Metz five days at least before the opening day.

A LETTER from Wolverhampton gives a description of an apparatus, provisionally patented by the Wolverhampton Corrugated Iron Company, the missance which arises from galvanizing works, but regarded as extremel which is capable of very extensive application, and the necessity for which will increase as chemistry for blasting purposes.

enlarges, as it is rapidly doing, its industrial applications. The process appears simple, and is spoken of as most effective.

At the monthly ballot of the Institution of Civil Engineers, on the 2nd inst., the following candidate were balloted for and duly elected:—As Members, Messrs. J. H. W. Buck, T. Dale, P. Greck, and H. J. Wylie. As Associates, Messrs. J. Bowden, A. M. Fowler, C. Hart. B. M. de Michele, J. Musgrave, E. W. Preston, A. L. Sacre, H. T. H. Siccama, A. H. Strongitharm, and J. W. Wilson. Mr. J. P. Van der Meulen was admitted as a Student.

On Thursday night week the Rochester bridge of the London, Chatham, and Dover Railway, caught fire. It crosses the Medway, and is of very wide span, the lower portion being constructed of massive wooden beams. The fire had gained considerable hold of the bridge, but owing to the close proximity of the water and other appliances, it was extinguished without any extensive damage been done. The same bridge has previously been on fire three or four times, as supposed from the fire dropping from the ashpan of a passing engine.

dropping from the ashpan of a passing engine.

At the general monthly meeting of the Roya Institution of Great Britain, held Monday, Feb. 1 Mr. W. R. Grove, Q.C., in the chair, Messrs. Edward Armitage, Geoffrey Bevington, Frederick Leighton, Frederick Nettlefold, Frederick J. Toulmin, R. O. White, William Edward Wilson, Philip Wright, and the Master of Lindsay, were elected Members of the Royal Institution. The special thanks of the members were returned for the following additions to "the Donation Fund for the Promotion of Experimental Researches":—Mr. Alfred Davis (third donation), £21; W. D. (third donation), £5 5s.

ANOTHER episode has just occurred in connection with what is popularly known as the Edmunds' scandal case. The pending action for libel brought by Mr. Leonard Edmunds against Mr. Greenwood, the solicitor to the Treasury, and which was to have come on for trial in the Court of Common Pleas by a special jury about this time, will not now be tried. At the last moment, all questions between Mr. Edmunds and the Crown, including the present action for libel, are referred to a court of arbitration to sit in public. The terms of the arbitration have been in agitation for the last eight months, and at last they are agreed to.

A NEW mode of tolling great bells has just been applied to the 4½ ton bell lately cast by Messrs. Taylor, of Loughborough, for Worcester Cathedral, and recently hung there. The bell has been hung on a new plan, which, with the clock and a peal of twelve bells, is designed by Mr. Denison, Q.C., and gives a new effect to bells which are too heavy to be rung in the usual way. The gudgeons, or pivots, instead of being round, are wedged-shaped, like those of a scale beam, and roll on hard brasses very slightly hollowed. The friction is thereby made so little that this great bell can be tolled easily by one man with one hand.

THE Metropolitan Street Tramway Bill came before Mr. Palgrave, one of the examiners of standing orders, recently, who, after the necessary proof had been given, decided that the standing orders had been ecomplied with. The Pimlico, Peckham, and Greenwich Street Tramway Bill has also passed standing orders, and was considered at a special meeting of the Greenwich District Board of Works, who, after hearing explanations from the engineer of the company, and examining the models of the rail proposed to be laid, approved of the bill, and instructed their clerk and engineer to agree to clauses with the company, and petition in favour of the bill.

A PROMINENT citizen of Detroit, largely connected with railways, is now causing to be made a thorough examination of the river, for the purpose of ascertaining the feasibility of tunnelling it. The project of a tunnel under the Detroit river has been discussed from time to time, but nothing looking to practical investigation of its feasibility has hitherto been attempted. If it is practicable to build a tunnel, it will prove an important link in the great central railway route between the West and the East. The examinations are being made, and we (American "Railway Times") understand are to be under the supervision of Mr. Chesbrough, the engineer of the Chicago tunnel, waterworks, &c.

Some successful experiments have lately been made with dynamite at a quarry at Oester Acker, in Norway, according to the "Mining Journal." Three shots were fired—the second, and principal one, being on a very large scale. The bore-hole was 21ft deep, and 1½ in. in diameter; 15lb. of the strongest dynamite, containing 75 per cent. of nitro-glycerine, being employed as the charge. It was estimated that about 264 cubic yards of earth were displaced; but it was not considered that the whole power of the charge had been utilized, and another charge of only 2½ lb. of dynamite produced a proportionably still greater result. On the whole, the experiments were regarded as extremely satisfactory, and as proving that dynamite is decidedly cheaper than gunpowder for blasting purposes.



# Patents for Inbentions.

# ABRIDGED SPECIFICATIONS OF PATENTS

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—2253, 2288, 2292
BUILDINGS AND BUILDING MATERIALS—2257, 2273
CHEMISTRY AND PHOTOGRAPHY—2261
CULTIVATION OF THE SOIL, including agricultural implements and machines—2279, 2297
ELECTRICAL APPARATUS—2271
FIBBOUS FABRICS, including machinery for treating fibre pulp, paper, &c.—2260, 2270, 2286, 2289, 2294, 2296
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—None.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—None.

GENERAL MACHINERY—2247, 2255, 2256, 2258, 2263 LIGHTING, HEATING, AND VENTILATING—None. METALS, including apparatus for their manufacture 2265, 2293

W165, 2293
MISCELLANEOUS—2246, 2251, 2259, 2262, 2262, 2267, 2272, 2276, 2278, 2280, 2282, 2283, 2285, 2287, 2290, 2295
ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2248, 2252, 2281
SHIPS AND BOATS, including their fittings—2268, 2275, 2291

2291 STEAM ENGINES—2254, 2269 WARFARE—2249, 2284

2246 G. Moulton, Manchester. Engraving. Dated July 17, 1868.

This relates chiefly to the pentagraph engraving machines employed to engrave or trace patterns or designs on the surfaces of cylindrical rollers, and consists, principally, in an improved method of effecting the reversal of the cutting tools, and is applicable more particularly to machines having but one row of tools, and of effecting the "stepping of the pattern" or the changing of the relative positions or portions of the complete design. In one arrangement, the tools are reversed by connecting the tool bar or carriage to an endless band, or to a band or bands acting as an endless band the band passing around drums or pulleys, so that the two opposite portions of the band move in opposite directions, the tool bar being connected to one portion of the band or to another portion of the band move in opposite direction, according as the tools are required to meve in the same direction as the tracer, or in a direction contrary thereto. The ends of the band are attached to a drum or pulley, which is actuated by an intermediate travelling bar, upon which the tool bar is mounted, the intermediate bar deriving its motion from the diminishing pulley of the pentagraph, the tool bar and the intermediate bar being mounted upon rollers in the usual manner. In another arrangement for effecting the same object, the band actuated by the tracer carriage is passed twice around or partly around each of the end carrier pulleys, so as to present two free portions of the band, moving when actuated in contrary directions, the tracer carriage being connected to either of the portions, according as the tool bar is required to move in one direction or the other. To connect the tool carriage or tracer carriage with the band, the patentee prefers to employabolt or screw, acting upon clips, in such a manner as that when the screw is turned in one direction, a clip is tightened upon a portion of the band. To effect the "stripping" or "changing," the screw is turned into an inte

2247 W. J. Ellis, Barnsbury. Cranes. Dated July 17,

1868.

This consists, first, in the employment of a lever or levers of the first or third order, operated by means of a screw jack, hydraulic, air, steam, or any other kind of press or machine, which may be employed for the purpose of the concentration of the force to be used; and, second, in the construction of swing cranes, which depend for support on their foundations to prevent their being overturned, with a holding-down bolt as centre pin or axis in place of the massive post hitherto employed.—Patent completed.

2248 E. FUNNELL, Brighton. Railway signalling. Dated

2248 E. FUNNELL, Brighton. natural segments.

July 17, 1868.
The principle of this invention is to give distant oscillations to a disc, combined with the striking of a bell, by a train passing over a treadle, in order to give warning to a signalman at a distance that the train is approaching. This is accomplished by a treadle in connection with wheelwork and an electrical apparatus, the whole to be made to act automatically.—Patent completed.

made to act automatically.—Patent completed.

2249 C. P. STONE, Dorset-square. War vessels. Dated
July 17, 1868.
The fighting capabilities of a vessel of war is developed
by providing a means of rapidly sinking the greater portion of the hull usually above the water, so as to present
less surface to attack. The patentee proposes to divide the
length of the vessel into sundry equidistant water-tight and
air-tight compartments, and to place a series of cylindrical

or polygonal cisterns in contiguity, and equilibriating the ship's centre of gravity, the spaces between the cisterns to be in communication with the space between the skins or air chamber. The water is to be admitted into each cistern by a sluice valve. These cisterns can be used to hold cargo or stores when not required for immediate use.—

Patent abandoned. Patent abandoned.

Patent abandoned.

2250 A. Woollan, Notting Hill. Watch protector. Dated July 17, 1868.

This protector or fastener is made of one piece of metal somewhat in a T shape—that is to say, having two horizontal and one vertical arms. The vertical arm of the T is bent at about half its length, so as to form a hook. In use, the fastener is secured to the article of apparel, or within a pocket, and a hinged catch is moved so as to release the hook; the ring or hoop of the watch is passed into the hook and the hinged catch fastened.—Patent abandoned.

2251 J. DUGUID Glassow. Paper. Dated July 17, 1868.

abandoned.

2251 J. Duguid, Glasgow. Paper. Dated July 17, 1868.
Webs of wire cloth are employed in place of felt on the rollers or cylinders, over which the paper or pulpy material passes on its way from the paper-making machine. The wire webs are made shorter than the felt webs at present used, they do not absorb moisture from the paper, and they do not require so long a travel to give them time to dry. By the use of wire webs, the injurious effects due to the moisture of travelling felts are avoided. Another advantage is that the wire webs, being free from shrinkage, may be made much narrower. The wire webs can be woven in looms and put on in the same manner as the felt webs.—Patent completed.

2252 W. J.C. Mug, Westminster. Permanent way Dated.

2252 W. J.C. Muir, Westminster. Permanent way. Dated

webs.—Patent completed.

2252 W. J. C. Mur, Westminster. Permanent way. Dated
July 17, 1868.

This consists, in the first place, of a sleeper made of cast,
wrought, or malleable iron or steel, with a horizontal flanch,
carried wholly or partly round its outward perimeter, and
so much above the base of the sleeper as to leave a vertical
edge or rim round the base under the flanch for ensuring
a perfect gripe, on or in the ballast, the normal transverse
section of the body of the sleeper, exclusive of projections, being a semiellipse, or the half of any other curve
resulting from a conic section. In the second place, it
consists in the application of this sleeper to a flat bottomed
rail, at the same time securing elasticity in the bedding of
the rail, without the interposition of wood or other packing, this being effected by casting on the sleeper two
narrow shoulders or fillets running along its upper side or
crown, their distance apart being such that the edges of
the foot or flanch of the rail shall rest on the fillets, leaving a hollow space under the middle of the rail, into which
it may deflect under pressure or concussion. In the third
place, it consists in a method of holding the rail to the
sleeper by the employment of a gripping piece or clip of
iron or steel, so formed as to fix also the tie-bar, which
connects a pair of sleepers, the tie-bar having a projecting
head, hole, siot, notch, or groove at or near each end, and
the gripping piece being held firmly in place by a key or
wedge.—Patent completed.

2253 C. J. Galloway and C. H. Holl, Manchester.

Patlers.

connects a pair of sieepers, the we-bar having a projecting head, hole, siot, notch, or groove at or near each end, and the gripping plece being held firmly in place by a key or wedge.—Patent completed.

2253 C. J. GALLOWAY and C. H. HOLT, Manchester. Boilers. Dated July 17, 1868.

According to one arrangement, the boiler is divided into two parts. The upper portion is supported over the fire space, the other is of a ring form, placed below the main portion, and connected thereto by tubes. The ring is adapted to receive the sediment, which may be removed therefrom by suitable taps or outlets. The upper and under surfaces of the upper portion of the boiler are connected together by means of tubes, which are considerably larger in diameter at the upper than at the lower end, and serve both as stays and flue passages. The diameter of each tube under its upper flange is equal to the outer diameter of the flange at the lower end thereof. To prevent the too free passage of heated products up these flue passages, a ball or hollow water chamber is connected above and below with the water in the boiler by tubes. The upper portion of the boiler may be continued down and serve as a jacket or water space surrounding the fire. In heating the water for the supply of steam boilers by means of water pipes applied in the flue, it is usual to apply dampers to regulate the draft, and the object of one part of the improvements in heating the water is to obtain a subdivision or more equal distribution of the currents of heated products to act on the feed water by employing a number of small valves, or dampers, or passages which are capable of regulation, in place of a large one. An upand-down motion is given to scrapers for clearing the external surface of the feed water heating pipes by means of external and internal gearing, or what is commonly called the mangle motion.—Patent completed.

2254 W. and W. T. EADES, Birmingham. Obtaining power. Dated July 17, 1868.

Two shafts are employed, upon the ends of which are secured two pai

ings, which also carries the drum upon which the chain rope is wound.—Patent abandoned.

2255 A. Brown, King William-street. Liquid meters. Dated July 17, 1868.

The patentee proposes to construct a vessel or cistern with four compartments, two of which contain floats nearly as large as the vessels in which they work, but not nearly so deep, the floats being quite independent of each other. In the third compartment is a tumbling weight which is employed to work a valve in the fourth compartment, and the tumbling weight is connected to each of the floats, so that supposing either or both of the compartments containing the floats to be full of liquid, the float or floats would be at the top, and as the fluid is drawn from either compartment the float will descend, and its weight acting upon the tumbling weightbefore mentioned, will cause it to fall over, and thereby reverse the position of the valve, and allow the empty compartment to fill with liquid, and the full one can be emptied at pleasure.—Patent abandoned.

2256 J. Roberts, King William-street. Cooling ressels. This consists in constructing, cooling, or refrigerating to be serewed, riveted, or other wast in brass or other material minus the end, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the rend, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the rend, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the rend, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the rend, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the rend, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the rend, namely, that part to which it may be ne

vessels or chambers of perforated metal or other material, in combination with any absorbent substance, by preference French stone or gypsum. This substance is used as a lining, by placing it between two pieces of perforated metal or other material, the shape of which will depend on the purposes for which it is required.—Patent abandoned. doned.

2257 S. DEACON, Hoxton. Sash fastener. Dated July 17,

The fastening consists mainly of two bars or arms work-The fastening consists mainly of two bars or arms working on centres, pins, or pivots. They are toothed at the inner ends, where they engage with each other, and they are worked so that their other ends approach to and recede from each other. One bar is worked by hand, and its teeth engaging in the other bar work it outward or inward as required. When the bars approach and lie near together over the division or opening of the sash, the fastening is effected, the teeth aided by a spring keeping tesbh ar closed.—Patent completed.

2258 R. MELBRUM, Cupar, North Britain. Rasing fuids.

2258 R. MELDRUM, Cupar, North Britain. Rasing fluids.

2258 R. Meldbeum, Cupar, North Britain. Rasing fluidsDated July 17, 1868.

An apparatus is employed divided into chambers, the lower one being a condenser, with a tube in the centre, containing a piston and rod, which is joined to another piston above, and a steam pipe from a boiler with a cock for screwing off and on, so that the steam coming into the chamber below the upper piston lifts the piston up the cylinder, and encloses a valve at a point where there is a tube in communication with a well or source of supply. The upper chamber is the one that the liquid is brought into, and it does not come into contact with the steam chamber. The cylinder at the junctions may be staffed outside to help to prevent rarefaction of the steam in its chamber. When the piston has been driven to the top of the chamber, as described, two rods fixed to the lower piston are raised up with the piston, and a paw with an eye slipping on another rod admits of each of these rods being raised without interrupting anything until the paws come to the connection with the slides of the valves, when they raise these two slides, and also another which closes one steam valve, and opens onother, letting the steam out of the steam chamber into the connection.

doned.

2259 E. A. COWPER, Westminster. Glass ornaments.

Dated July 17, 1868.

This consists in the construction and use of pieces of glass of peculiar form, punched out of a heated sheet or thin piece of glass in such manner that the natural polished surface of the glass is left untouched by the punch or bolster, no hole being formed in the glass so punched out, but the surface on one side being rounded or convex, and on the other side flat, or nearly so. The flat surface can stick on to any article of dress, to be ornamented by means of cement.—Patent abandoned.

2260 D. SOWIEN and R. C. STEPHENSON Bradford. Stufe.

mented by means of cement.—Patent abandoned.

2260 D. Sowden and R. C. Stephenson, Bradford. Shuttles. Dated July 18, 1868.

This invention relates to the pikes of shuttles, and the improvements consist in constructing them with a spring attached at the point and expanding at the root end of the pike. This pike is hinged in the shuttle at the root end (as usual), and a spring peak or stop-piece is fixed, so that when the pike is turned or pushed out from the shuttle to place on or remove the spool therefrom, the spring comes in contact with the plate which presses the spring close against the pike, thereby allowing the spool to pass easily or freely on or off the pike.—Patent abandoned.

2261 D. Werster Southout Gas. Dated July 18.

2261 D. WEBSTER, Southport. Gas. Dated July 18,

1868.

This consists in preventing or removing the accumulation or incrustation of carbonaceous deposit on the interior surface of retorts employed in the manufacture of coal gas, such deposit arising from the back pressure of gas from the "seal dip" in the hydraulic "main." The improvements consist in the employment of a hollow or other ball seated upon a conical seating applied within the ordinary gas exit or "stand pipe," and acting as a valve, such ball being suspended by a chain passing over a pulley or attached to a lever, so that when the gas is rising up the "stand pipe" it will lift the ball valve and pass on, but if the retor the opened for refilling, or other purpose, and the gas ceases to rise its own weight, or the back pressure from the other retorts closes the ball on to the seating and prevents the gas escaping; if desired, an ordinary "clack valve" or other valve may be arranged in the pipe for the same purpose. A supply pipe and exit pipe and taps are also applied to the "hydraulie main," whereby the tar liquor may be drawn off, and the main may be filled with pure water at any moment required. By this means a considerable economy is effected in the manufacture of gas by the prevention of the escape into the open retort by back pressure. The illuminating power is improved and the duration of the retorts is considerably increased by the diminution of the deposit therein, and also the labour of scarfing is prevented.—Patent completed. consists in preventing or removing the accumula-

and also the labour of scaring is prevened.—Fascincompleted.

2262 T. Kendrick and S. Davies, Dudley. Fire-irons.
Dated July 18, 1868.

This consists in casting the head bow and one leg in an entire piece in metal, on the side of the bow, or consignous thereto. There are two projections, by means of which the tongs are extended when the projections are pressed simultaneously. In certain cases, the patentees prefer to cast the head and bow in an entire piece, and attach a leg made with ornamental metal tubing, such leg to be screwed, riveted, or otherwise united to the other parts. The poker may be cast in brass or other material minus the end, namely, that part to which it may be necessary to apply a piece of iron or steel, known to the trade as the shank, being the remotest end from the handle. The head and shank of a shovel is cast in one piece, and the pan is attached to it in the ordinary way. In casting these articles, or portions of the same, it is matter of choice whether they are cast in a solid form or by means of a core to render them partially hollow, so as to economize the weight of metal.—Patent completed.

2263 C. G. JOHNSON, Stockton-on-Tees. Kilns. Dated



partly so, by flues, through which the heated gases from the kilns are led. On the tops of the trucks are clay slabs 2 in. or more in thickness, to protect the metal work of the trucks from the heat of the kiln. According to one arrangement, the bricks or other articles, as they are moulded, are placed on trucks running on rails which pass through a drying flue heated as above described. The trucks enter the drying flue at one end, and when the bricks or other articles are sufficiently dry, the trucks are passed out at the opposite end, the bricks or other articles are then loaded on to other trucks to be burnt. These bricks are carried on trucks running on rails which pass along in front of a series of kilns, so that the trucks upon which the bricks or other articles to be burnt are piled, may be brought in front of any of the series of kilns, and then run off the trucks that carry them on to lines of rails that pass through such flue or kiln, or any other convenient arrangement of points and crossings or turntables may be employed to convey the bricks or other articles from the machine to the drying flue and thence to the kiln or from the machine to the kiln. When a flue or kiln has thus been filled up from end to end with trucks, the kiln is fired through holes in the top, beginning at one end of the kiln and gradually passing on to the opposite end, so as to drive forward the heat, together with the smoke and moisture from the bricks or other articles, and the heated air and smoke is, by means of a chinney, drawn by return flues up the two sides and middle of the drying chamber in which the articles are dried before being burnt. The firing of the kiln baving commenced at one end, is continued by degrees to the other, the amount acted on at one time being regulated by dampers applied to openings from the kiln into the flues.—Patent completed.

2264 J. GUL, Palerno. Engine. Dated Jly 18, 1868.

in which the articles are dried before being burnt. The firing of the kiln baving commenced at one end, is continued by degrees to the other, the amount acted on at one time being regulated by dampers applied to openings from the kiln into the flues.—Patent completed.

2264 J. Gill., Palermo. Engines. Dated July 18, 1868. This consists in improvements in the construction and arrangements of certain parts of the mechanism of heat motive engines. First, in steam engines, and also in engines working by the expansive energy of other hot elastife fluids. The inner surfaces, expassed to the contact of the working steam or other hot fluids, are covered with enamel or glass fused directly on to the metallic surfaces, which are preferably prepared with shallow undercut grooving, or otherwise roughened or furnished with indentations or projections to hold the vitrified coating more tirmly in place; or the surfaces are protected from contact with the working steam by covering them with metallic canefiled plates, or plates of glass, baked earth, or natural stone laid in cement impervious to steam, and held in place by screws, clamps, or equivalent contrivance, instead of mineral covering, as above-mentioned. Second, in steam engines the temperature of the interior rubbing surfaces of the cylinder is kept up for keeping in direct contact with these surfaces as much as possible a movable mass of steam censtantly at or near the full boiler pressure on one side of the piston or pistons while the working steam is undergoing various stages of expansion from full pressure to the vacuum in the condenser on the other side. This is effected by making the cylinder, longer than what is usually required for a given length of stroke, preferably about double that length, and using a long double-headed piston or two pistons firmly connected together. The space being in free communication with the boiler, and preferably forming a passage for the whole working steam on the one hand, and its exhaust into the condenser on the other. Thus the

2265 J. THOMAS, Newcastle-on-Tyne, Smelling furnaces,

2265 J. THOMAS, Newcastic-on-Tyne. Smeating Jurnaces. Dated July 18, 1-865.

The main features of this invention in addition to the general arrangement or combination of the parts, are the construction of water boshes, and the employment of spikes in the water boshes.—Patent completed.

spikes in the water bosnes.—Fatent completed.

2266 W. Berry, Kingsland Green. Lighting shops.

Dat d July 18, 1863.

This consists, first, in making any part of a building, or of any window, movable; the movable portion is supported by guide rods, slides, or other apparatus, and cords attached to the window frame, sash bars, or architectural dressings. Second, at the back of the facia or movable part of a building, an illuminating apparatus is fixed, consisting of one or any number of lights, such lights having suitable reflectors so arranged that the whole or a greater

part of the light may be thrown upon the window; a por-tion of the light may illuminate the facia or other movable part of the building.—Patent completed.

part of the building.—Patent completed.

2267 F. C. Steinbach, Brussels. Pipe joint. Dated
July 18, 1868.

The pipes are formed with a spigot and socket coupling,
and with an annular groove or grooves on the outer
periphery of the one pipe and the inner periphery of the
other, in a manner that will allow (when the pipes are put
together) of the grooves of the pipes to be coupled. Into
the annular chambers molten lead or other metal or plastic
material is run, and, on cooling, a solid locking ring will
be produced.—Patent abandoned.

2268 W. B. Laky, Changer, lang. Peopling. (A com-

be produced.—Patent abandoned.

2268 W. R. Lake, Chancery-lane. Propelling. (A communication). Dated July 18, 1868.

In order to carry out this invention, the patentee employs a case or cylinder provided with a piston, which is brought to act upon the water, by means of a horizontal engine, through a lever with a long and short arm. The piston rod of the engine, by means of a connecting arm, is always connected with the short arm of the lever, which short arm must never exceed one quarter the length of the long arm. A shaft, which forms the fullerum or axis of the lever, may be either supported above, hung below, or placed on the deck of a boat. This shaft may also be provided with a lever for working the valves of the engine.—Patent abandoned.

2269 T. RONELL Newcastle, Slide valves. Dated July 20.

2269 T. BONELL, Newcastle. Stide valres. Dated July 20,

1863.
For this purpose the patentee forms each valve with a solid back, and an outside frame sliding on it and against the central plate, so as to prevent steam passing to the back of the valve. These outside frames are formed with V or wedge-like edges, acted upon by other suitably-formed edges, which are borne upon by springs from the valve.—Patent abandoned.

edges, which are borne upon by springs from the valve,—Patent abandoned.

2270 H. B. Barlow, Manchester. Spinning, &c. (A communication). Dated July 29, 1863.

This invention is applicable to slubbing and roving frames, and other machines for preparing throus substances, and to machines for spinning and doubling. It consists in an improved mode of driving the spindles of such machines, and of arresting the motion of any spindle without interfering with the working of the others. In performing this invention, the spindles to be driven are supported in two bolster rails, and near the lower end of each spindle is fixed a friction pulley made of leather; this pulley rests upon another friction pulley made of east from, fixed on a horizontal shaft, and on this shaft are fixed as many pulleys as there are spindles to be driven. This horizontal shaft is driven, and corresponds to the shaft now in use, when the spindles are driven by bevel wheels and pinions. In front of each spindle, and supported by stude fixed in the bolster rails, is a flat vertical rod, the lower end of which is bent at right angles; this passes under the lower end of the spindle when it is required; to stop a spindle, the attendant slightly raises this rod, and thereby lifts the friction pulley on the spindle out of contact with the pulley on the horizontal shaft.—Patent completed.

this rod, and thereby lifts the friction pulley on the spindle out of contact with the pulley on the horizontal shaft.— Patent completed.

271 T. W. Gray, Limehouse. Lightning conductors. Dated July 20, 1868.

This consists in the application of lightning conductors to ships or vessels of a composite build of wood and iron, and also to ships or vessels of from with wood masts. In the case of a composite built vessel of wood and iron, with wood lower masts, the iron beams, or any iron whereon the line of conductors are fixed, is to be covered with wood or other non-nonducting material, and the plates of metal—or strip of copper, by preference used as lightning conductors—are fixed on the same, or on the under side of wood deck to ship's side, and partly down the ship's side, with metal bolts, in connection through the ship's side, with metal outside, or to the water, more particularly in the case of a double planked or skinned ship's side, so that there may be independent metal bolts for connecting the metal plates or strips with the metal or water outside. In the case of a composite vessel with tabernacle masts, or masts stepping on or terminating at the deck, the same to be fitted—from keel of mast, along upper side of wood deck—to ship's side, and thence overbeard to sea direct. The masts, if of wood, are fitted as usual with plates or strips of metal.—Patent completed.

usual with plates or strips of metal.—Patent completed.

2272 W. WINTER, Leeds. Swing machines. Dated July 20, 1868.

This invention relates to means of working the needles and shuttles of sewing machines, and the improvements consist in the construction and use of self-compensating levers, or levers which compensate for the wear of the joints or connecting parts. Heretofore, in the working of these machines—by the constant reciprocation of the needle bars and shuttle drivers—the joints wear away quickly, requiring frequent repairs. Now, to remedy this evil, the patentee forms the lever arm which connects therewith in two parts or in two prongs, the one having a tendency to spring off from the other. These parts or prongs are (when the levers are applied) pressed together and inserted into a slot hole formed in the needle-bar, and the same with respect to the shuttle-driver, so that, as the slot holes or the levers wear, the expansive tendency of these levers will always compensate.—Patent completed.

2273 W. J. CUNNINGHAM, Oxford-street. Raising blinds.

levers will always compensate.—Patent completed.

2273 W. J. Cunningham, Oxford-street. Raising blinds.

Dated July 20, 1888.

This consists in applying an elastic band or a metal spring to an ordinary nail or hock in the window sash, the other end of which band is sprung on a C-shaped hook round which the cord for raising and lowering the blind works, the hook being hidden from sight by any suitable ornament; or the india-rubber or other band may be sprung on a hook with a pulley attached, around which pulley the cord for raising and lowering the blind runs; so that, on pulling the cord, the blind or other article is raised or lowered without noise and with extreme facility, or a curtain or blind may be pulled aside in a horizontal direction when so required by slightly aftering the position of the respective parts.—Patent completed.

2274 E. Beanes, Maidenhead. Brewing. Dated July 20

2274 E. BEANES, Maidenhead. Brewing. Dated July 20 1868

1868.
This consists in the use of sulphurous acid in the state of gas, or its aqueous solution, or of acid sulphites, or bisulphites of sodium, potassium, calcium, magnesium, ammonium, or aluminium. These chemical agents are applied to the brewing materials—such as malt or sugar—directly, or mixed with the water added to them before their entrance into the mash tun, during the process of mashing, or during the process of boiling the wort with

the hops, but the patentee prefers to operate during the mashing, and with the aqueous solution, or the salts of sulphurous acid. The aqueous solution of acid sulphite of sodium—which will give a slight red colour to blue litmus paper, and a very pule lead colour to red litmus paper, and a very pule lead colour to red litmus paper—is preferred, the proportions being about 16 to 20 ounces of the salt to each quarter of malt, or, when sugar is used for brewing, from about 16 to 20 ounces of the salt to 200lb, weight of sugar.—Patent completed.

brewing, from about 16 to 20 ounces of the salt to 200lb weight of sugar.—Patent completed.

2275 R. SMYTH, Glasgow. Propelling. Dated July 20, 1868. The apparatus comprises a paddiewheel arranged on a vertical shaft in a casing formed in the vessel's sides. The framing of the paddiewheel consists of two discs fixed at right angles on the shaft, and a series of spindles parallel to the shaft extend between, and are carried by them. Each spindle has a pair of short arms fixed on it close to the insides of the discs, and a paddle or float is fitted with journals turning in the ends of the arms so as to turn on an axis parallel to the spindle, such axis being at or near one edge of the float. When the float is pressed in one direction, it bears against the spindle, but when not pressed, it is free to resume the position of least resistance. The positions of the spindles and their arms are, in one modification, controlled by cranks formed or fixed on their outer ends outside of the disc, the pins of the cranks being in holes in a third disc mounted so as to turn on a boss disposed eccentric tily as regards the paddle-wheel shaft, this arrangement being similar to what is in use with ordinary feathering paddle-wheels. The paddle-wheel shaft, this arrangement being similar to what is in use with ordinary feathering paddle-wheels. The paddle-wheel projects partly out of the casing, and as the floats are carried by it out of the casing, they assume positions at right angles to the vessel's course, so as to propel in the most direct and effective manner, whilst, when they are passing round through the interior of the casing, they offer the least possible resistance.—Patent abandoned.

2276 C. P. WILCOX, Mold, Flintshire. Counting machine.

2276 C. P. Wilcox, Mold, Flintshire. Counting machine. Dated July 20, 1568.

This consists of certain elements comprising annull or flanged dises, the flanges being graduated, and the divisional spaces figured or numbered as required, as to form circular or cylindrical scales. These scales are placed side by side on a central shaft, upon which they are free to rotate, and are connected with and turned by each other in succession by wheel work, the whole being enclosed in a cylindrical or other shaped case, having an opening or openings therein through which the figures or numbers on the scale wheels are visible. The central shaft, when turned by a crank or otherwise, gives motion to the first wheel or scale (on the right), the first to the second, the second to the third, and so on, the number of turns of the shaft being indicated by the figures on the rotating scales, from 1 up to 1.000.000 (more or less), according to the mode of gearing and graduating the scales and the number of scales or wheels with which the machine is fitted.—Patent completed.

2277 T. G. GREEN, Derby. Earthenware. Dated July 20

2277 T. G. Green, Deroy. London and the following materials. The patentee takes a material known to minerallogists as granular quartz or taleose quartz, which is a substance containing quartz and steatite or take, and he mixes with this material about two-kixths of China clay and one-sixth of ball clay. The proportions can be varied as circumstances may require. — Patent abandonal

doned.

2278 L. Rose, Leith. Artificial champagne. Dated July 20, 1888.

The patentee first extracts the mucilage from raw lime or lemon juice. This is placed in vats for the mucilage to be thrown down by means of Spanish earth or isinglass. After the juice has become perfectly clear, it is drawn off and mixed with cane or other sugar, using about 6lb (avoirdupois) of sugar to each gallon of juice. This sweetened juice is again refined by subjecting it to the same process. At this period, two per cent, of sulphurous acid, free or combined, as in the form of bisulphate of lime or otherwise, being mixed to prevent fermentation by the action of the sugar on the juice, which being accomplished, the juice is drawn off into champagne bottles, filling the bottles half full with this syrup, and afterwards it is acrated by any suitable process, such, for instance, as the process adopted in making lemonade.—Patent completed.

2279 R. Brett and G. Danielles, Bentley, Suffolk. Farm

aerated by any suitable process, such, for instance, as the process adopted in making lemonade.—Patent completed, 2279 R. Brett and G. Danielle, Bentley, Suffolk. Farm machinery. Dated July 20, 1868.

This consists of improvements in engines to be chiefly employed in ploughing land. The patentees mount the drum upon a shaft, which is supported at top in the frame of the machine, but free to oscillate thereon; the shaft passes through the drum, and its position is regulated by a set screw working in a frame below, so that by turning the serve with drum may be set at any angle that may be desired for the efficient working thereof, viz., for winding thereon the wire or other rope to haul a plough or other implement. The drum is driven from the crank shaft of the engine, to which a bevel pinion in keyed, in gear with another and similar bevel pinion on a horizontal shaft carrying another pinion is capable of being allowed to run loose on the shaft when it is not required to drive the drum. Sometimes, instead of using the bevel pinions before described, motion is imparted to the horizontal shaft by a strap or straps from the crank shaft of tengine. Another part of the invention relates to appartus for moving the machine from place to place, along the headland, for example. It consists of a drum or wheel to receive a wire or other rope on each or either end thereof; the drum, which may be made in one or several parts, is fitted with cogs or teeth, and motion is imparted to it by a worn on the horizontal shaft of the machine; a clutch is provided for throwing the worm in or out of gear with the teeth on the drum, according to whether it is desired to drive the drum or to allow it to remain at rest.—Patent completed. to drive the drum or to allow it to remain at rest, -Patent completed.

J. RAINE, Richmond, Yorkshire, Photography.

Dated July 20, 1868.
This consists in dividing the camera into two or more equal This consists in dividing the camera into two or more equal parts by means of a division so constructed as to produce a picture with a soft or vignetted margin, and an arrangement by means of which the camera, after one view has been obtained, may be moved through such a degree of space as to cause the margin of the second picture taken so to superimpose and unite with that of the first as to yield a panoramic view by the junction of the several pictures thus obtained. The method employed to effect this softening of the margin consists in having a divisional partition in the camera, which division is composed of a



metal or other band with serrated edges, and passing metal or other band with serrated edges, and passing over two pulleys—one at the top and the other at the bottom of the camera. The width of this band is so adjusted that when a lens is fitted into each division of the camera, and a sensitive plate is exposed when the camera is pointed at any uniform body, the serrated edge of the band — which must be moved by means of a handle attached to the axis of one of the pulleys over which it travels—shall so soften the edges of each picture as to produce a continuous effect of lighting. To apply this for taking a penorama, the camera is made to rotate upon a table in such a manner that, after a view has been taken on one portion of the plate by means of one lens, the camera is rotated a certain previously determined distance, and the second picture is taken.—Patent abandoned.

2281 J. Hodeson, Richmond, Surrey. Transporting

on one portion of the plate by means of one lens, the camera is rotated a certain previously determined distance, and the second picture is taken.—Patent abandoned.

2281 J. Hodden, Richmond, Surrey. Transporting loads. Dated July 20, 1868.

This relates to transporting produce or material, contained in a suitable vessel or carriage, along a rope or wire stretched between two fixed points; and the improvements consist in so arranging the supporting points of such rope or wire, and so constructing the pulleys, sheaves, or wheels and pendants which suspend the vessel or carriage, that the pulleys shall be capable of passing the supporting points of the rope or wire without hindrance, thus enabling the wire to be supported at any required number of points, and thus establishing a continuous communication for any desired distance, and also in combining, with the employment of a pair of fixed wires or ropes placed side by side, the use, as herein described, of a continuous endless rope or wire passing round pulleys or sheaves placed near the extremities of the fixed wires or ropes, and capable of receiving motion from the revolution of these palleys or sheaves, which revolution is to be caused by the application to them of any suitable power. By this means the distribution of the material (to be carried in suitable vessels or carriages) is secured at stated intervals along the line of carrying wire or rope, so that no portion of the wire shall be unduly weighted, but that a continuous stream of vessels or carriages shall be constantly transmitted in one direction on one wire, and in the opposite direction on the other for such distances as shall be required. In mounting the wires for this method of continuous transmission, it is proposel to secure them on each extremity of a cross bar of any convenient length, fixed to a post or other upright of such height as circumstances shall require, and hold them in a loop of iron fixed to the extremity of the cross bar, or pass them through a channel similarly fixed, the side

completed.

2282 W. H. and A. M. BATES, and H. FAULKNER, Leicester. Flexible tube. Dated July 20, 1868.

The patentees make use of a core of india-rubber, which is capable of being stretched or extended longitudinally, so that, by reducing its diameter, it may be more easily withdrawn from the interior of the tube, when the latter is finished, than the cores now employed in the manufacture of tubular articles. Upon a core thus made, a tube is formed in the ordinary way, either of sheet rubber, or of compland, or of rubber cloth, and this constitutes the lining of the improved tube or hose. The covered core is then placed in a braiding machine supplied with any suitable number of threads or wires according to the intended diameter of the tube; and these threads are braided round the core in the well known manner, but very tightly. The core, as it travels forward to the braiding threads, must be coated or payed over with solution in which the braiding threads will imbed themselves as the braiding operation proceeds.—Patent completed.

2283 A. HOMFRAY, Worcester. Screening and washing

threads will imbed themselves as the braiding operation proceeds.—Patent comploted.

2283 A. Honfray, Worcester. Screening and washing coal. Dated July 20, 1868.

This relates to an improved means of separating the coal from bats. An inclined screen or platform is constructed, the surface of which is divided. The lower edge of each portion into which the screen is thus fivided is situated somewhat higher than the top edge of the portion next below it. The screen is thus made to have a step-like figure. Between the bottom edge of one step and the top edge of the next below it, an open space is left of sufficient width to let the bats and other impurities fail through. The coal to be treated is put on the top of the screen, which is set at such an angle that the coal descends thereon. The pieces of coal acquire in descending such a momentum that they are carried on to the top of the second step. The bats being flat and specifically he vier than the coal, there is greater friction between them and the screen, and on reaching the edge of the first step they fall through the opening there, and are thus separated from the coal. When the bats approximate in density and size to the lumps of coal, a transverse bar is fitted to the second step, which arrests the motion of any bats that may not have fallen through the opening and prevents them acquiring sufficient momentum to carry them over the opening at the bottom of the second step on to the third step. Any required number of steps with openings in the screen, in order to separate any coal that may adhere to or have fallen through them.—Patent completed.

2284 C. Weekes, Westminster. Fortifications. Dated July 20, 1868.

2284 C. WEEKES, Westminster. Fortifications. Dated

The patentee proposes to make rectangular shells of three kinds—lirst, an iron brick of the length, width, and depth of a common brick; second, an iron quoin or angle brick, being by preference of the length of a brick and a-half along each outer face, the width and depth being as before stated; the third, a T or iron tie-brick, the length, width, and depth of each limb being also equal to that of a common brick. The whole of these shells or iron bricks, quoins, and ties are intended to take the place of ordinary bricks in any kind of structure. These shells may also be formed so as to dovetail or lock into each other by projections on one brick fitting into recesses in the other.

The joints may be close or surface joints, made with iron or other cement, or run with lead or other metal or materials. The angle bricks or iron quoins to be applied to all main wall or other angles, and the Ts or tieblocks to all junctions of cross walls with main walls.—Patent completed.

waii or other angles, and the Ts or teblocks to all junctions of cross walls with main walls.—Patent completed.

2285 F. Green, Fulham. Lamps. Dated July 21, 1863. For this purpose a long closed receptacle or vessel is constructed, fixed by preference in the back of a carriage, into which vessel the volatile oil or spirit is introduced through the roof of a railway carriage. At each end of the vessel an overflow pipe is fixed therety, leading down to an overflow reservoir situated und smeath the carriage or seat so that, should the vessel be fixed beyond the desired level, or should it be tilted considerably by the motion of the carriage, the oil or spirit will escape through such overflow pipes, and be collected in the overflow reservoir. On the upper surface of the vessel are fixed one or more burners, through which the vapours of oil or spirit rise, and are burnt; just below the top of the burner is fixed a cup or receptacle, into which a small quantity of spirit is poured when it is desired to light the lamp, which spirit, in being ignited, heats the burner sufficiently to volatilize the oil or spirit in the wick that passes partially up the burner, and thus the lighting of the lamp is readily effected.—Patent abandoned.

2286 T. KOHN, Hartford, U.S.A. Cleaning silk. Dated

lamp is readily effected.—Patent abandoned.

2286 T. KOHN, Hartford, U.S.A. Cleaning silk. Dated
July 21, 1868.

The object of this is to lessen the breaking of threads
during twisting, and consists in taking the threads from
the bobbins, leading them up and down, over and through
guides, and into a vat or trough containing liquid, thence
on to the reels.—Patent completed.

2287 T. DESCHAMPS, Paris. Glore fastener. Dated July 21

This consists in the combination of a hooked plate a short piece of braid or tape on one side of the glove, and an eyelet on the other. The plate is adjustable on the braid. Also in the use of a loose ring on the tape to pass over a stud.—Patent completed.

over a stud.—Patent completed.

2238 F. Warren, Birmingham, Heating water. Dated July 21, 1868.

This consists, first, of a hollow ring, which forms the base of the apparatus, in which ring an opening is made for the inward flow of the water. This ring is fitted with any number of tubes, so arranged as that they shall converge into a centre, and connect with another ring or chamber above. In the upper ring or chamber an opening is made for the outlet or flow of the heated water through a tube attached thereto. Second, a stove or casing of metal is constructed and lined with fire bricks or other suitable material. A space is left where necess try between the one which constitutes the fire chamber. This chamber is made sufficiently large to allow of the boiler or heater being suspended or fixed therein.—Patent abandoned.

2259 A. A. Wille, Woodford, Beaching feathers. Dated

2289 A. A. WILLE, Woodford. Bleaching feathers. Dated

The feathers are first washed and fatty particles removed therefrom, after which they are steeped in a bath, composed of water, muriatic acid, and chromate of potash, sulposed of water, muriatic acid, and chromate of potash, sulphate of copper, and sesquioxide of iron, the proportions of these ingredients being for a bath, for, say, 2th avoirdupois of feathers, 12 gallons of water, 14 pint of muriatic acid, 5 oz. of chromate of potash, loz. of sulphate of copper, and 1-8th pint of fluid sesquioxide of iron. This bath is heated to a lukewarm temperature, and the feathers are allowed to remain in the same for about three days, more or less, depending upon the quality of the teathers. These are then removed and washed with soap, and rinsed, after which they are to be steeped first in a boiling solution of salt of sorrel, and lastly ina cold bath composed of starchy water, with a small admixture of blue and pink colouring matter. The feathers are then dried and well beaten, when they will be ready to be curled and otherwise prepared for use.—Patent abandoned.

2290 J. M. HECTOR, Dorset. Pusee boxes. Dated July 17.

2290 J. M. HECTOR, Dorset. Fusee boxes. Dated July 17,

2290 J. M. HECTOR, Dorset. Pusce boxes. Dated July 17, 1868.

The boxes are formed with a sliding or opening side, which, when opened, allows the inner mechanism to be adjusted, and the box to be supplied with fusces. It also has a sliding or opening end, which, when pushed aside, allows the fusce to protrude from the box in obedience to the action of the mechanism. At one end of the box is pivoted a hollow drum, provided with a coil spring, and to this drum is attached a cord, which passes round a pulley at the opposite end of the box, and is then attached to a cross bar, which can slide up and down the box in slots or guides provided for the purpose. When the box is to be filled, the sliding or opening side is removed, and the cross bar is drawn to the end of the box, and there held by a catch or other suitable contrivance. The fusces are then laid in the box with the heads and splints alternately pointing to each side, the ends of the splints being inserted into the slots, until a layer of fusces is placed from the crosspices above mentioned, to the sliding or opening end of the box. Then the sliding or opening side is closed, the eatch being at the same time released. The spring in the drum, which is now coiled, acts on the drum and puts a tension on the cord tending to draw the cross bar to the end of the box and pushing the fusces before it.—Patent completed.

2291 J. J. ASTON, Temple. Propelling. Dated July 21,

1868. This relates to an improvement to the floats. The inner ends of the floats nearest to the boat are curved, and so formed as not to work close up to the vessel, like the ordinary floats. One effect of the improved floats is that the water is not forced too much against the sides of the vessel, as by the ordinary floats, the speed of the vessel is thereby accelerated. Another effect is that the vessel will be less shaken, as the floats enter into and leave the water more gradually than the common floats.—Patent abandoned.

2992 A. M. CLARK, Chancery-lane. Feeding boilers, (A communication). Dated July 21, 1868.

This consists of a self-feeding apparatus. A float is employed, maintained on the surface of the water; the float is an connection with a bell crank lever to the stem of a valve placed within a connection piece of the suction pipe. When the float descends to the lowest level, the valvo is opened, and water is free to pass the piston of the pump, which is kept always in action.—Patent completed.

2293 T. Gibb, Jarrow-on-Tyne. Treating ores. Dated July 22, 1868.
In treating ores or compounds containing sulphides, the patentee employs, for the purposes of calcination, a furnace

of any form, having one end thereof maintained at a conof any form, having one end thereof maintained at a considerably higher temperature than the other end. The re-containing sulphur, as before mentioned, is placed on the hotter part of the bed near the fire bridge, and there calcined until the sulphur is expelled, or until the ore is, as it is technically termed, "dead." It is then moved towards the flue or cooler end of the furnace, and a fresh charge of ore placed on the hot bed. The gases produced in calcining the freshly charged ore pass over that previously charged, and change the oxides of copper or other metal contained in the latter into sulphate; should this effect not be completely obtained by the sulphurous acid gas produced in calcining the ore, sulphurous acid gas otherwise produced may be passed through the furnace.—Patent completed.

2224 4 Markin Stroud. Edition. Dated July 22, 1868.

Patent completed.

2204 G. Martin, Strout. Fabrics. Dated July 22, 1868. The rags or materials to be operated upon are placed in a suitable stove or chamber. The vessel or chamber is then made as air-tight as is practicable, and a vacuum or partial vacuum created therein by exhausting the air therefrom as completely as possible, as well understood. In connection with this vessel or chamber is placed a generator of any suitable and convenient form, in which is generated the gas, vapour, or steam necessary for the operation. The gas, vapour, or steam is allowed to enter the vessel or chamber by pipes, such vessel or chamber being previously heated to bodge, or 200deg. Fah. For bleaching purposes, a sulphur stove or retort is connected with the vessel or chamber, and charged with sulphur vapour. The rags or other materials having been subjected to the influence of the sulphur vapour, are then washed and prepared in the usual manner.—Patent completed.

2205 C. W. Bradshaw, Stubbington, Hants. Coupling

and prepared in the usual manner.—Patent completed.
2295 C. W. Bradshaw. Stubbington, Hants. Coupling
pipes. Dated July 22, 1868.
This consists in the employment of a male and female
socket so arranged that a ring is introduced between the
two before joining, upon which ring eccentric grooves are
formed which act upon two wedge-like pieces of metal
introduced in openings formed in the female socket. By
turning the ring before mentioned the wedges are drawn
in and close upon a bevel in the male socket, and thus
form a secure and water-tight joint.—Patent abandoned.

in and close upon a bevel in the male socket, and thus form a secure and water-tight joint.—Patent abandoned.

2266 J. H. Johnson, Lincoln's Inn-fields. Colouring matters. (A communication). Dated July 22, 1868.

This relates to the production of a red colouring matter from and by means of a substance or produce derived from maphthaline by means of nitric acid, and after the separation of the free acid from the nitro-naphthaline. The product thus resulting is subjected to the reducing action of either zine or iron or other reducing agent in conjunction with an acid, by preference acetic acid. The product thus obtained is then to be acted upon at a temperature of about 120 deg. Centigrade, with acetic acid, by preference crystallizable, and with a nitrate, by preference nitrate of soda, and to this mixture, or to the substance thus acted upon, naphthalamine is added; the mixture is allowed to remain at or about the temperature indicated, until the desired colour has been produced; it is then removed, and after being subjected to the action of cold water and hot water, containing acetic acid, the colouring matter is obtained in solution, from which it may be separated either by means of common salt or otherwise, as is well understood by manufacturers of aniline colours. The colouring matter thus obtained may be dissolved in alcohol or other solvent, and may be employed for the purposes of dycing and printing.—Patent completed.

2297 S. LANGDALE, Newcastle. Artificial manures. Dated July 22, 1868.

This consists in subjecting mineral phosphates of limo or coprolites in a divided condition to the action of sulphuric acid at or about its boiling point the decomposition of the phosphate will be much facilitated, and the solution of certain compounds of iron which may 16 present will be prevented or diminished.—Patent abandoned.

# APPLICATIONS FOR LETTERS PATENT.

Dated January 26, 1869

236 C. L. Wood, Howlish Hall, Bishop Auckland, Durham, and J. Stockley, Newcastle-on-Tyne, Northumber-land, Improvements in apparatus for grinding plate glass.

237 E. D. Ruston and W. W. Mills, Birmingham. Improvements in supporting and flying win-low sashes, which improvements are also applicable to the supporting and flying of the windows of railway and other carriages and suspended doors and shutters.

238 J. D. Ellis, Sheffield. An improved method of rolling armour plates.

ing armour plates.
239 J. and J. Wilson, and G. Cryer, Cross Hills, Kild-wick, Yorkshire. Improvements in machinery for preparing, drawing, and finishing wool, cotton, and other

ores. 240 J. Millar, Cambridge-road, Middlesex. Improve-

240 J. Millar, Cambridge-road, Middiosex. Improvements in the manufacture of envelopes.

241 J. Wilson, Poppleton, Yorkshire. Improvements in machinery for shaking straw.

242 J. Pickering. Glasgow. Improvements in treating timber, and in the means employed therefor.

243 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in ventilating apparatus. (A communication).

243 W. R. Lake, Southampton-anisings, Chancery-lane. Improvements in ventilating apparatus. (A communication).

244 A. V. Newton, Chancery-lane. Improvements in machinery for cutting veneers. (A communication).

245 H. Law, Essex-street, Strand. Improvements in apparatus for connecting soft metal and other pipes, and for attaching cocks and other fittings thereto.

246 C. Gill, Boulevart des Capucines, Paris. Improvements in the manufacture of sugar.

247 C. French, Omega-terrace, Eandford-square, Middlesex. Improvements in means or apparatus for intercommunication on railway trains.

248 C. Marher, Salford, Lanca-hire. Improvements in machinery or apparatus for singeing fabries by gas flames, 249 T. Reeder, Preston, Lanca-hire. Improvements in the manufacture of sheet metal rolers, and in the machinery employed therein.

250 J. Gough, Kirby-street, Hatton-garden, Middlesex, Improvements in applying ink or colour to printing surfaces.

fac

ares. 251 J. Taylor, Britannia Works, Birkenhead, Chester



Improvements in machinery or apparatus for propelling ships, also partly applicable as hoisting tackle and for other purposes.
252 T. Vaughan, Middlesborough-on-Tees, and J. W. Smith, Manchester. Improvements in treating smoke and soot for the preparation of an article of commerce therefore.

therefrom.

253 H. Barcroft, Glen, near Newry, Armagh, Ireland.
Improvements in the manufacture of damasks and other
similar material, and in the machinery therefor.

254 J. Porteous, Edinburgh, and H. Gibson, Musselburgh, Mid Lothian. Improvements in the manufacture
of tobacco, and in the machinery or apparatus employed
therefore.

of tobacco, and in the machinery or apparatus employed therefor.

255 T. Brown, Newgate-street, City. Improvements in liquid discharging apparatus for extinguishing fire and other purposes, and in the means for generating gas within such apparatus. (A communication).

256 J. H. Johnson, Lincoln's Inn-fields. Improvements in keys or wedges to be employed in the permanent way of railways, and for other like purposes. (A communication).

257 B. Girdwood, Edinburgh, Mid Lothian. Improvements in envelopes, and in bags such as are used for transmitting samples.

238 E. H. Prentice, Stowmarket, Suffolk. Improvements in the manufacture of phosphatic manures.

ments in the manufacture of phosphatic manures.

259 J. Silman, Birmingham. Improvements in the manufacture of knives for cutting out the soles of boots and shoes.

G. Tangye, Birmingham. Improvements in letter

copying presses.

261 C. Lungley, Greenwich, Kent. Improvements in letter
building and working caiseons and pontoons for lifts and
floating and dry docks and other structures in iron and

floating and dry docks and other structures in iron and wood.

262 A. C. Pass, Bedminster Smelting Works, Bedminster, Bristol. Improvements in the method of, and apparatus for, condensing and purifying metallic and other rumes, vapours, gases, and smoke, and in obtaining oxide of zinc.

263 C. W. Petersen, Norton Folgate, City. Improvements in lifeboats, which improvements are also applicable to steam tags, pilot-boats, and tenders.

Dated January 28, 1869.

264 R. M. Marchant, Torrington-square, Middleeex. An improved mode of obtaining and applying power for locomotive and stationary purposes, and apparatus connected therewith.

265 W. Sourrier. Birmingham. An improvement in

nected therewith.

265 W. Spurrier, Birmingham. An improvement in salt spoons and other spoons.

266 W. Brown and T. H. Garbutt, Seamur, near Scarborough, Yorkshire. Improvements in firebars.

267 R. Jones, Botolph-lane, City. Improvements in means or apparatus used in curing or preserving animal substances, which improvements are also applicable in cleansing and impregnating vegetable substances.

268 C. D. Abel, Southampton-buildings, Chancery-lane. Improvements in machinery or apparatus for washing

Improvements in machinery or apparatus for washin wincing, fulling, and finishing textile fabrics. (A com

munication).
269 C. L. A. Hoelscher, Fleet-street, City. A musical

chair or seat.
270 B. Blackbee, Norfolk-road, Dalston, Middles

chair or seat.

270 B. Blackbee, Norfolk-road, Dalston, Middlesex.
An improved pessary.

271 A. Browne, King William-street, City. An improved rotary engine. (A communication).

272 L. P. Hebert and L. A. Moulin, Neulily-on-Seine, Arenue due Roule, Department de la Seine, France. An improved press for stamping letters, books, and documents with ink or other colouring matter.

273 J. Box, South Sea House, City. The destruction of burrs or other vegetable or ligneous matters found in wool in its raw or ummanufactured state.

Dated January 29, 1869.

274 J. Easterbrook, J. H. Allcard, and A. M. Wild, Sheffield. Improvements in apparatus for grinding and polishing engine slide bars, shear blades, marble slabs, saw blades, and other flat surfaces where great accuracy is required.

275 N. C. Szerelmey, Belgrave-road, Pimlico. Improvements in making tarpauling in different colours, and in treating sail cloth and other fabrics to preserve them from rapid destruction by the sea, air, and other corroding influences.

276 G. Hawkeley, Montrose Villas, Caledonian-road, Middleser, Improvements in Middleser, Improvements Improvements in Middleser, Improvements Im

rapid destruction by the sea, air, and other corroding influences.

276 G. Hawksley, Montrose Villas, Caledonian-road, Middlesex. Improvements in the manufacture of ventilators and chimney-pots.

277 W. M'Lean, Glasgow. Improvements in printing, and in the machinery or apparatus employed therefor.

278 J. Pickering, Glasgow. Improvements in the propulsion of ships, vessels, and boats.

279 T. W. Carter, Gray's Inn-road, Middlesex. Improvements in the construction of ships and vessels, in order to facilitate propulsion and steering, and the protection and repair of the propellers and rudders.

280 J. M'Donaid, Hackney, Middlesex. Improvements in stoppers or valves for bottles and other like vessels.

281 S. Smith, Hyson Green Brass Works, near Nottlingham. Improvements in tape or valves for regulating the flow of steam, water, and other fluids.

282 G. Hawksley, Montrose Villas, Caledonian-road, Middlesex. Improvements in pumps, and in apparatus connected therewith.

283 G. Price, Birmingham. Improvements in window fastenings.

283 G. Price, Diffininguals.
fastenings.
284 J. H. Johnson, Lincoln's Inn-fields. Improvements in the manufacture of piles, faggots, or billets of iron or stoel, and in the machinery or apparatus employed therein. (A communication).
285 A. M. Clark, Chancery-lane. Improvements in machinery for hulling or decorticating grain. (A communication).

nication).

286 A. Mallard, Moorgate-street, City. Improvements in horse shoes. (A communication).

287 F. Jay, South Lambeth-road, London. Improvements in the manufacture of oil paint.

Dated January 30, 1869.

288 T. E. Lundy and T. Hood, City-road, Middlesex. Improvements in apparatus for driving sewing machines by electro-magnetism.

289 T. Whimster, Perth, North Britain. Improvements in apparatus for exhausting, washing, and forcing

by electro-magnetism.

289 T. Whimster, Perth, North Britain. Improvements in apparatus for exhausting, washing, and forcing gaseous or seriform bodies.

290 P. J. Wielemans, Lisle-street, Leicester-square, Middlesex. Improvements in ovens.

291 W. Weldon, Park Villa, West Hill, Highgate, Middlesex. Improvements in the regeneration of certain compounds of manganese from certain residues, and in the manufacture of chlorine and oxygen.

292 T. Pimbley, Bayham-street, Camden Town, N.W. An alarm communication between railway passengers, guard, and engine driver.
293 S. Taylor, Sheffield, and G. W. Dyson, Tinsley, Yorkshire. Improvements in the manufacture of spade and shovel moulds.
294 H. N. Nissen, Mark-lane, City. Improvements in printing bankers' cheques and similar documents.
295 K. C. Watson, Glasgow, Improvements in boats.
296 E. T. Hughes, Chancery-lane. A new file planing machine. (A communication).
297 E. T. Hughes, Chancery-lane. A new file cutting machine. (A communication).
298 R. Wood, Sowerby Bridge, near Halifax, Yorkshire. Improvements in steam engines, or applicable thereto.
299 J. Tolson, Dalton, near Huddersfield, Yorkshire. Improved means or apparatus for cleaning the eards of carding engines or machines having cylinders or rollers clothed with cards used in the preparation of wool, cotton, or other fibrous substances.

or other fibrous substances.

300 G. H. Adam, Birmingham. New or improved apparatus to enable the driver of a locomotive engine to ascertain the condition of the train drawn by the said engine.

301 T. H. Kilner, Lepton, near Huddersfield, Yorkshire. An improved feed apparatus adapted to carding and condensing machinery.

densing machinery.

302 Å. S. Andrews, James-atreet, Old-street, Middlesex.

densing machinery.

302 A. S. Andrews, James-street, Old-street, Middlesex. Improvements in horse collars.

Dated February 1, 1869.

303 J. T. Bintley, Kendsl, Westmoreland. Improvements in billiard tables and bagatelle tables, by which balls may be sent or returned to either end thereof otherwise than along the surface.

304 J. Whyts, Hoxton, Middlesex. Improvements in the construction of tallors shears and scissors.

305 C. D. Abel, Southampton-buildings, Chancerylane. Improved modes of, and apparatus for, casting ingots. (A communication).

306 T. G. Daw, Regent-street. An improved machine for forming stereotype matrices.

307 J. A. Limbert, Gravesend, Kent. Improvements in machinery or apparatus for raising, lowering, and moving heavy bodies, and for operating punching machines and the feed motion of circular and other saws.

308 J. A. V. Newton, Chancery-lane. Improvements in machinery for condensing alivers. (A communication).

309 J. A. A. Fontaine, Somerset Hotel, Strand. An improved hydrostatic hoist.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," February 2, 1869.

From the "London Gasetta," February 2, 1889.

2906 J. G. Piton. Bushing the sheaves of blocks employed for lifting heavy weights.

2918 F. C. Caivert. Dyeing yarns.

2921 E. W. Halliday. Lubricating cylinders.

2922 H. Lomax. Sewing machines.

2923 A. Booth and J. Harrison. Sewing machines.

2926 J. H. Glew. Button-holes for boots.

2927 C. Heptonstall. Looms for weaving.

2930 H. Woods. Apparatus for heating water by means of steam.

of steam. 2934 E. Death and J. Ellwood. Apparatus for cutting leather.

er. 38 J. F. Wanner. Machinery for embroidering fabrics. (A communication).
2939 W. T. Watts and D. J. Fleetwood. Hydraulic

2941 J. Torbitt. Preservation of the potato. 2944 J. Wright and W. H. Williams. Manufacture of

s burners 2250 R. R. Ozland and J. Hucking. Calcining ores and

ninerals.

2951 E. Prevost. Electro-magnets.

2953 H. Davey. Steam engines.

2959 P. Spence. Manufacture of copperas.

2950 J. Petric. Machinery for washing wool.

2961 J. Jones and G. E. Wilkinson. Manufacture of ardboard.

2901 J. Jones and G. E. WHEIRSON. Manufacture of refibeard. 2904 H. Gibson. Manufacture of tobacco. 2905 F. E. Doring. Machinery for boring rock. 2909 W. M'Adam. Apparatus for facilitating omnibus

2971 G. A. C. Bremme. Machinery for untwisting

2973 R. Duncan. Earth closets. 2975 J. Smith Weaving fustians. 2977 W. E. Gedge. Swimming apparatus. (A commu-

nication).

2978 A. M. Clark. Apparatus for raising and lowering 2978 A. M. Clark. Apparatus for raising and lowering weights. (A communication).
2284 W. Hallam and H. J. Madge. Conversion of tin plates shearings into tin plates.
2994 A. Lafargue. Gauges for indicating the pressure of steam.
2996 W. E. Newton. Treating metals. (A communication)

tion).
2997 W. E. Newton. Scissors sharpener. (A communi-

2997 W. Manufacture of artificial stone, 3006 H. Highton. Manufacture of wristed tobacco. 3013 R. Legg. Manufacture of twisted tobacco. 3090 M. P. Manfield. Soles of boots. 3174 J. Ashcroft. Safety valve for the boilers of loco-

notives.

3175 A. Denayrouse. Dresses for divers.

3200 J. A. Farrar and R. R. Huntley. Hatches and abin tops of ships.

3271 J. Loader and W. H. Child. Rotary engines.

3280 A. M. Clark. Machinery for scouring wool. (A ommunication).

3384 M. B. Westhead and C. B. James. Packing addiage.

seddles.

3403 H. L. Bennison. Rotary engine.

3403 G. and J. Wilson. Kilns for burning bricks.

3525 D. Burns. Chemical compounds for treating diseases of the generative organs.

3681 C. D. Abel. Manufacture of steel. (A communi-

cation).

3769 H. Carter and G. H. Edwards. Breech-loading

firearms.

3825 T. C. Fidler. Bolling stock of railways.

89 A. P. Price. Production of colours from naphthaline.

(A communication).

114 A. V. Newton. Reaping and mowing machinery.

(A communication).

142 H. A. Silver. Apparatus for cooking.

188 F. Lipscombe. Purifying water.

207 F. R. Ensor. Manufacture of Ensor net or lace.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

### LIST OF SEALED PATENTS. Sealed January 29, 1869.

2399 T. C. Fidler	2432 L. C. Bailey
2400 C. D. Fox	2458 M. Benson
2401 W. T. Royle	2501 J. Brown
2402 F. A. Leigh	2502 A. M. Clark
2403 J. Ratcliffe	2543 C. Evotte
2404 A. G. Day	2556 A. M. Clark
2405 J. F. Lackersteen	2660 W. M. Jackson and
2418 H. Moritz and J.	R. Garaides
Beinach	3468 J. Howard and E. T.
2414 H. Moritz and J.	Bousfield
Beinach	3698 A. C. Sterry, F.
2422 J. A. M'Kean	Lambe, and J. Ford-
2424 M. Wilkins and J.	red
Clark	3759 H. A. Bonneville
<del></del>	

Scaled February 2, 1869. 2343 L. Wray
2439 W. Spence
2444 B. J. B. Mills
2450 C. G. Johnson
2455 W. Millard
2457 E. Edwards
2464 W. and E. M. Hann
2467 W. M. Moore
2469 C. J. Curtis and A.
Fiddes
2473 N. Salamon 2480 S. Gardner 2489 F. Walton 2503 J. Salmon 2532 R. Saunder 2570 C. J., W., A 2532 R. Saunders 2570 C. J., W., A., and F. Simpson 2659 T. Wrigley 3033 B. E. B. Newlands 3036 R. Helimann and P. Hart 3804 H. A. Bonneville

PATENTS ON WHICH THE STAMP DUTY OF 484 HAS BEEN PAID.

258 J. M. A. Montolar 286 J. Bobertson 301 C. Delafield

402 R. W. Armstrong 430 J. Tomlinson

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

223 G. H. and E. Morgan 293 J. L. Norton 283 D. Joy

PROVISIONAL PROTECTION FOR SIX MONTHS
Has been granted upon Specifications bearing the following numbers:—

	1	1	,	1		1	7
2885	65	115	128	139	152	165	176
8727	94	116	129	140	158	166	178
8877	98	117	130	141	154	167	180
3879	107	119	181	142	155	168	182
8885	108	121	182	148	156	169	184
3891	109	122	188	145	157	170	186
8901	110	123	184	146	158	171	188
8911	111	124	185	147	159	172	190
8927	112	125	136	148	160	178	192
29.	118	126	137	150	162	174	194
29, 64	114	127	138	151	164	-7.	1
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# LIST OF SPECIFICATIONS PUBLISHED, For the week ending January 30, 1869,

	1	•		_		_			1 1		
No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	e. d		8. d.	_	s. d.		s. d.		s. d.	_	n. d.
1785	0 8	1905	0 8	1961	2 4	2014	0 10	2039	0 4	2059	0 10
1805	0 10	1910	0 8	1971	0 10	2016	0 4	2040	0 4	2062	0 4
1816	0 8	1911	1 0	1976	0 10	2019	0 4	2041	0 4	2066	0 4
1838	0 8	1919	0 8	1981	0 8	2021	0 10	2042	0 4	2068	0 8
1862	1 4	1924	1 4	1989	0 10	2023	1 0	2045	0 4	2069	
1864	1 4	1933	1 4	1990	1 4	2024	0 6	2046	0 4	2070	0 4
1871	1 (	1935	1 0	1998	1 8	2025	0 10	2047	0 8	2072	0 4
1874	0 8	1941	1 0	2000	8 0	2026	0 8	2041	1 4	2073	ii
1881	3 6	1949	1 6	2004	1 0	2028		2050		2076	
1892	1 10	11953	0 10	2005		2031		205:		2077	
1894		1955		2007		2032		2054		2082	0 10
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THE

### **MECHANICS'** MAGAZINE.

LONDON: FRIDAY, FEBRUARY 12, 1869.

# SMITH'S LIQUID FUEL FURNACE.

THE important question of raising steam by means of liquid fuel appears to find a more ready solution on land than it does on We have several examples of the successful application of the principle to land boilers, but only one instance, at present, on a practical scale, of its adaptation to marine boilers. This arises, to some extent, from the different conditions of each case, the facilities being far greater in many respects in a factory than on shipboard. It is, however, we believe, only a question of time to over-come these difficulties, and to render the adoption of liquid fuel afloat as simple and as easy a matter as it now is ashore. But in the meantime, we are carefully noting its progress on terra firma, and to this end we recently visited the works of Mr. A. Smith, at the Marsh Gate, Stratford. Mr. Smith is a large manufacturer of brushes, which are made from the fibre of the cocoa-nut shell, and in his factory is a considerable quantity of machinery. This, of course, involves the use of steam and the consumption of coal to raise it. Now, coal—as all steam users know is an expensive item in the year's accounts, and an opportunity offering of using creosote, Mr. Smith devised a method of burning it with highly satisfactory results. But before success was achieved, some twenty different modifications of the system were tried, until at length—about a year ago—the present arrangement was finally decided upon, and has been at work ever since. The apparatus is as simple as it well can be, consisting only of a supply tube for the creosote and a steam jetinside it. The creosote is stored in an underground tank outside the engine-house, from which it is forced up by steam pressure into a reservoir, also outside the engine-house, and to which is attached a float and a graduated scale, by which the consumption of oil is ascertained. A supply pipe from the cistern with a regulating cock is turned into the tube of each of two Cornish boilers, 18ft. long, 5ft. diameter, with flues 2ft. 6in. in diameter. The oil supply pipe projects about 9in. into the boiler tube, the mouth of which is simply covered by a plate of thin sheet iron, which is raised or lowered to regulate the draft. Into the oil tube is turned a smaller tube carrying the superheated steam, which issues from small apertures at its nozzle.

The creosote is thus driven into the furnace with great force, being broken up into the finest spray, and forming a powerful flame, which impinges upon a heap of brick core in the tube which is maintained at a red heat.

From the single jet, steam is easily kept in each of these boilers at a constant pressure of from 55lb. to 60lb., which is supplied to or from 5515. to 6015, which is supplied to two engines for driving the machinery. One of these engines is a 10-horse power horizontal; the other, a 30-horse power beam engine. Besides the two boilers already mentioned, there is a third of the same dimensioned, in which steam is kept up by the waste and refuse produced in the factory, the steam being used only for heating purposes, and not for the engines. This boiler is always going, and in the morning supplies steam with which the creosote furnaces are started. From what has been stated, it will be readily

and his consumption for the two boilers is seven barrels of thirty-six gallons each per day of 12 hours. But taking the cost at the fair price of 1d. per gallon, we have only £1 1s. per day, or 10s. 6d. for each boiler. Mr. Smith's consumption of coal used to be 21 tons per day—a great contrast in point of expense to his present working. Then, there is a further saving in attendance, a boy being well able to do all that is necessary, whilst there is no clinkering, nor are there any firebars to burn out. Altogether, a great economy is realized, and much credit is due to Mr. Smith for the simplicity and efficiency of his invention, which he has patented.

Before concluding, it may be interesting to notice the leading features of the conversion of the shell or husk of the cocoa-nut into fibre, for the various purposes to which it is now applied. The shell or outer covering of the nut is first soaked in a tank of water kept warm by steam from the third boiler we have noticed. When sufficiently soaked, the shells are conveyed to a hopper, through which they are fed to a crushing mill. This mill consists of two coarsely-fluted rollers, between which the shells pass and are crushed. They are They are removed thence to the fibre mills, of which there are fourteen. Here the shells are drawn in between two rollers, behind which are arrangements for tearing away the finer fibre and leaving the coarser in the hands of the operator, who presents first one and then the other half of the shell to the action of the mill. The coarse fibre is then carried away and prepared for conversion into brushes and brooms. There are twenty boring lathes in another part of the factory, at which as many men were at work boring the holes in the heads and backs of future brooms and brushes which are to receive the tufts of prepared fibre. The finer portions of the fibre are removed from the mill, and undergo a process of final dressing. This is effected by feeding them through a hopper into a circular screen in which an Archimedean screw rapidly revolves. The fine fibre is delivered at the mouth of the screen, whilst the dust and smaller particles of fibre are carried through the sieve. The fibre thus produced is used for making mats and matting; the siftings find a ready sale with florists and market gardeners for manure. As the sweepings and refuse are collected and burned under one of the boilers, it will thus be seen that every particle of the husk of the cocoa-nut is utilized in a manner beneficial to the interests of mankind.

## THE CHALMERS TARGET.

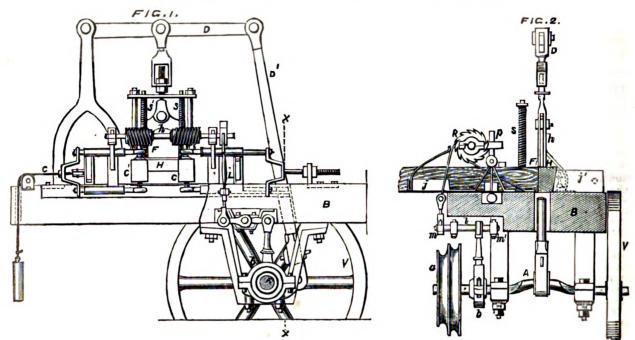
THE recent death of Mr. James Chalmers lent a melancholy interest to the experiments which were carried out at Shoeburyness yesterday week with the last target designed by that gentleman. Although considerable hopes were entertained of the new target, they were not realized on the present occasion, the target having been pierced in every direction with the projectiles which were directed against it. Our readers are so well acquainted with the details of the Chalmers target, that it is unnecessary here to repeat them. It will be sufficient to state that the target lately experimented on was 15ft. long, by 9ft. high, the face being composed of two 4½-inch armour plates of the same length as the target and 4ft. 6in. deep. The target was 2ft. 94in. thick including the angle iron ribs at the back. Mr. Chalmers had introduced eight modifications of backing, so that the target was divisible into as many different parts, each representing a mo-dification of the general principle. A "Warrior" target had been made, and was placed

Chalmers target, it is unnecessary to follow closely the details of firing. Eight rounds in all were fired, five with solid shot and three with live shell. Rounds 1, 4, and 5 with solid shot were directed against the "Warrior" target, through which they failed to pass. Round 1 knocked a piece out of the edge of the target, and rounds 4 and 5 penetrated the target, but remained in it. Rounds 2 and 3 with solid shot were fired at the Chalmers target, through which they passed clean out to the rear. The first live shell struck the to the rear. The first live shell struck the "Warrior" target, making a hole 22.3 inches deep, whilst the second and third shells passed through the Chalmers target, and burst in the rear. It was thus made apparent that the face plate of the latter target was much too weak for the work it was designed to do, and that in effect Mr. Chalmers had pushed his principle of elasticity too far. There is no question of the soundness of the principle, but the extreme lightness of the outer plate neutralized any effect obtainable from the backing. It is to be regretted that such a mistake in the designs of this target should have been made, and still more that the inventor is not here to profit by it, and to bring the labour of years to a successful iggne.

# THE SANITARY CONDITION OF OUR NAVY.

THE sanitary condition of the British Navy is a matter to which considerable interest has always attached, and which has been increased of late years by the introduction of iron-clad ships. It was one of the arguments against them that, under certain conditions, disease would be engendered, and that health in general would suffer. perience has proved that not only is this not the case, but that iron-clads show very favourably as to their general sanitary condition when compared with other vessels. The comparative freedom from disease in iron ships is strikingly evidenced in the reports which have passed through Dr. Mackay's hands, and which are embodied in the blue book just issued, relative to the health of the navy for the year ending June 30, 1868. The average ratio of cases of disease and injury in our iron-clads appears to have been 1340.8 as compared with 2065.8 in the second-rate vessels; 1459 in fourth-rate, 1457.1 in fifth-rate, 1541 in sixth-rate, 1940.4 in sloops, 2227.7 in gun vessels, per 1,000 of force. On the home station the iron-clads were the healthiest of "Warrior," "Defence," "Royal Oak," and "Pallas," exhibit the highest ratio of cases in the sick list. In the "Warrior," catarrh prevailed, but no serious disease occurred. The "Defence" was a newly-commissioned ship, and only trifling ailments attacked her crew. The men of the "Royal Oak" suffered less than might have been expected from "enthetic" disease, which was also of a less severe type. This is attributed to the a less severe type. This is attributed to the fact that the Contagious Diseases Act is in operation at Portsmouth, where the men went on shore. The same ship went to Portland, and at that time the men contracted more disease on shore, and it was of severer type, the Act not being in opera-tion at Portland. On board the "Pallas" mumps occurred. So that in the iron-clads on the home station the sickness was not of a severe kind. A large amount of the sickness on board the iron-clads in the Mediterranean was of a trifling nature. The "Lord Warden" shows the highest ratio of cases, almost entirely attributable to the prevalence of catarrh. So with the "Caledonia." understood how great a saving Mr. Smith effects in the item of fuel. The boiler, which is kept up with the refuse of the factory, costs, of course, nothing; whilst the two oil furnaces cost very little, as Mr. Smith has a contract for the supply of the crossote at a very low price, infortunately, proved only the failure of the of coaling at Gibraltar. Of the vessels on

# MACHINE FOR MAKING LUCIFERS.

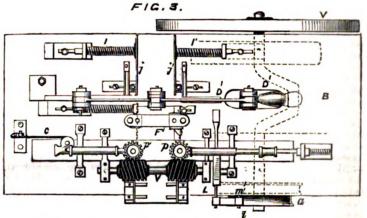


he North American station, the same may be said. The returns from the "Royal Alfred" are most satisfactory; a few catarrhs alone seem to have occurred.

Turning to the general view of the health of the navy, it appears from the report that during the twelvemonth the total force in the service afloat amounted to 50,340, the deaths 558, and of these 420 were occasioned by disease, and 138 by wounds and injuries. The rate of mortality was 11 per 1,000 or 3.7 below the average of the last twelve years. The highest death rate was observed in the China and west coast of Africa stations, being 21.7 and 20.4 respectively, accounted for by the occurrence of dysentery and cholera in China, and fevers on the west coast of Africa. The number of drowned amounted to 85 in all. The total number of cases entered in the sick list was 64,997, or 1295.7 per 1,000, an increase of 39.9 per mille over the rate of the previous year, and 144.2 less than the average of the last twelve years. On the East Indies and Cape station the sickness was in large amount, 2041 per 1,000, but this is explained by the fact that many vessels were employed in the Red Sea upon the Abyssinian expedition, and the men in them were harassed by hard work and multifarious duties in an unhealthy climate, and under exposure to the sun, the prevailing illness having been of a febrile nature. As to the invaliding, the ratio was 34.7 per 1,000 of mean force—about the average. The rates for the several stations average. The rates for the several stations were as follow:—Home, 21·3; Mediterranean, 27·8; North America, 41·6; South-East Coast of America, 25·9; Pacific, 44·5; West Coast of Africa, 86·5; East Indies and Cape, 77·9; China, 61·9; Australia, 17; irregular force, 25·9 per 1,000. On the whole, we may congratulate ourselves upon the general improvement which has taken place in the health of our navy during the place in the health of our navy during the last few years, and which cannot fail to increase as sanitary measures are more persistently insisted on and strictly carried out.

# MACHINE FOR MAKING LUCIFERS.

IN a memoir presented to the Société des Ingenieurs Civils, by M. Henri Peligot, it is estimated that the daily consumption of lucifer matches in France, is at the rate of half-a-dozen per head of the population. The proportion for England is as high as eight, and it reaches nine for Belgium. Basing the estimate upon that of six per head per diem estimate upon that of six per head per diem,



the daily consumption of these useful little articles throughout the whole of Europe will be over two thousand million. The weight of lucifer matches varies considerably. Those most in use in France give about 1,340 to the pound, while the same weight will yield three times as many of the round and square description common in Austria and Sweden. Striking an average, and assuming 1,700 as the datum, the daily quantity of wood con-sumed in their manufacture would amount to three hundred tons. Poplar and aspen are the trees generally felled for the production of matches. The weight of the former per cube foot is equal to 27lb., and that of the latter to 40lb. As timber, however, is purchased in the log, an allowance must be made for waste, and taking the mean of the two descriptions of timber, the cube foot would only weigh, when squared and reduced to actual available dimensions, about 20lb. Again, an allowance must be made for loss by sawing and other causes that will arise before the wood becomes converted into the marketable article. Summing up these several deductions, it will be found that out of a cubic foot of rough unhewn timber not more than a quantity equal to 18lb. will be practically utilized. Upon this supposition, the annual consumption of timber for the manufacture of lucifer matches throughout the whole of Europe will amount to 14,800,000 cube feet, or 296,000 loads, reckoning 50 cube feet to a load.

The manufacture of matches is a branch of the industrial arts, that has given rise to the formation of several important establishments

one in Austria employs 5,000 workmen, and the MM. Four et Cie, of Marseilles, have work enough for 1,000 more. It is calculated that upwards of 50,000 persons are concerned in the fabrication of these articles in the various countries of Europe, and that the value of their production reaches the figure of £120,000. Before describing the action of the machine represented in the accompanying engraving, a brief mention of the general operations attending the manufacture of lucifer matches will not be without interest. The first step consists in cutting up the blocks of wood, which may be accomplished with the saw, the knife, the machine, or the plane. When the knife is the instrument employed, the block is cut at once to the required length. It is then cleft twice in opposite directions by a large knife strongly resembling that used by bakers, and by these means small thick pieces are produced ready to be "dipped" previous to undergoing the final operations. The dipping is simply plunging one end of the wood into a quantity of sulphur in a state of fusion, and the next process is effected by inserting the sulphurized extremity into a pasty chemical preparation, which is spread out upon a marble slab to the thickness of about the tenth part of an inch. The cutter of the plane used to divide these small blocks into single pieces has a peculiar formation. It is composed of a flat quadrangular bar, of cast steel, 5in. long, half an inch broad, and a quarter of an inch thick. This bar is slightly turned up at one end, and thinned down by the file. Three cylindrical holes are drilled in it, which become the cutters which divide the block into and firms for that particular purpose. A large small round parcels. Some planes have five

More-

holes in them, and consequently can subdivide a block into five smaller pieces at one blow. The blocks are in lengths of about 2ft. 6in., and the blow of the plane being given along the entire length, they are at once divided into three or five smaller pieces. These are made up into bundles and tied together with strong twine. Subsequently, the cutting of these bundles into their proper lengths for lucifers is accomplished either by a knife similar to that already described, or by a circular saw. The whole operation is conducted with extreme rapidity, a single workman being able to cut up blocks in one day sufficing to furnish 2,000,000 matches. If the plane commonly employed in the Austrian establishments be supposed to be converted into a machine, it will give an excellent idea of that in ordinary use in France. The cutter of the plane is pierced with either three or five holes, and at every forward stroke cuts the block into as many subdivisions as there are holes in the cutter.

As may be expected, there have been numerous patents taken out for machines to accomplish rapidly and effectually the operations just described. That illustrated in the accompanying cuts has been recently patented by M. Charles, and presents some novel and interesting features.\* One of the principal of One of the principal of these is, that it cuts the wood in such a manner as to leave a certain portion, forming either the top or bottom of the packet, uncut, so that it ties the matches, as it were, together. Consequently, a single match can be detached from the rest, without destroying the union and apparent solidity of the remainder. machine is represented in figs. 1, 2, and 3, in elevation, section, and plan. It is supported upon a stout frame or table B, underneath which are bolted on a pair of brackets, carrying, by means of journals, the cranked shaft A, which is set in motion by the application of any force applied to the driving pulleys a. At the other extremity of the shaft is fixed the flywheel V, and close to the pulley is attached the eccentric b, which regulates the rate of advance of the block to be operated The eccentric b also acts upon the small cranks m m 1 (see figs. 2 and 3) which are fixed in succession upon the little axle l. The crank m 1 is connected by a double spindle to the rod L, which acts upon the tooth wheel R attached to the axle v. This latter carries an endless screw, v and v working in the pinions p and p, and, consequently, setting in motion the grooved cylinders C C  $^1$ , which regulate the movement of the wooden block undergoing incision. The cylinder C is undergoing incision. kept in a constant position, but C<sup>1</sup>, through the medium of the cord c which suspends a weight of about 35lb., exercises a constant pressure, sufficient to move the block, which nearly balances the above weight. Figs. 1 and 2 show the knife H, to which a vertical, rectilineal and alternate motion is imparted by means of the lever D and the rod D, one end of the latter being attached to the cranked shaft A (see fig. 1). It will be seen that the knife is hafted into a handle &, which, by means of a screw, can be raised or lowered at pleasure, so as not to allow the knife to descend low enough to cut the wood right through, and thus destroy the distinguishing characteristic of the machine. A plate of iron, F, is maintained by the screw SS<sup>1</sup>, pressed tight against the block of wood, so that it ugnt against the block of wood, so that it should not spring under the action of the knife. The block of wood advances by the motion of the grooved cylinders C C¹, between two girders j and j, between which is a plate acted upon by a spring. This plate serves to keep the blocks in a proper position, notwithstanding the various thicknesses that may be given to them. All the component may be given to them. All the component parts of the machine are so arranged that they may be taken to pieces and readjusted with ease and rapidity. Those who know what an inconvenience it is to upset a whole box of

\*We extract the cut from our valuable cotemporary
"Le Genie Industriel."

matches in the attempt to extract one, will appreciate the value of the principle which permits one to be detached, while the remainder retain the shape and consistency of an apparently solid mass.

## THE HEATON STEEL PROCESS.

N view of the important advantages which I will accrue to our great manufacturing industry from the introduction of the Heaton process of making steel from iron of inferior brands, it is satisfactory to know that the commercial features of the undertaking are prospering. Just a month since, we noticed the progress of this invention, which had previously been described by us in all its details.\* In our last article, we discussed the correspondence which had taken place in the "Times," between Mr. Heaton and Mr. Bessemer, and which embodied numerous points of working detail that substantiated both the value and the validity of the invention. have now to draw attention to the commercial phase of the question, which, as will be seen by the prospectus of the "Heaton Steel and Iron Company," in our advertising columns, is highly satisfactory. cipal portion of the capital has already been subscribed, and one-fourth of the shares is now offered to the public as preference shares. It appears from the articles of association of the company, that these shares will be enti-tled to a prior dividend for each current year of 6 per cent., and an additional dividend of 25 per cent. of the net surplus profits. No monetary consideration is to pass to the pro-prietors of the patents for the purchase of their interests, nor are those parties to par-ticipate in any profits whatever until the dividends on the preference shares have been paid. Indeed, a more favourable prospectus could not be presented to the public, who will not be slow to appreciate the terms offered to them, based as they are upon an invention which has proved itself a thorough success from practical working. The merits of the process are further established by experi-ments which have been carried out by Pro-fessor Miller, Mr. Robert Mallet, and a French commission under Professor Gruner, whilst the iron and steel produced have been proved to be of a highly satisfactory character by Mr. Kirkaldy's testing apparatus. In short, we are glad to see that both from a scientific and a commercial point of view, the Heaton pro-cess promises to mark an important era in the history of the iron and steel manufacture of Great Britain.

### DICTIONARY OF ENGINEERING.

A NEW dictionary, or any species of book, of the character of an encyclopædia, must, throughout every portion of its multifarious cortents, in some degree resemble the "latest edition" of a daily journal. Every subject upon which it professes to treat, either sparsely or in detail, must be illustrated by the most recent examples, and the old school of ideas, words, and deeds discarded for the more modern scientific and enlightened principles of thought and action. That there are several very excellent works of the nature alluded to, already in existence, every engineer is aware of, but not one of them can be considered to lay the smallest claim to the title of modern. When we turn a reflective glance at the enormous strides that every branch of engineering has made during the last twenty years, it will be admitted that a literary production, embracing all the prominent features of the different phases of the profession, was very much needed. Judging from the three numbers of "Spon's Dictionary of Engineering" that

have already appeared, we consider it well adapted to supply the present deficiency. At the same time, there are a few points in which there is room for improvement, and in order to indicate these for future revision, we will briefly scan the contents of Nos. 1, 2, and 3. There appears to be a little typographical slip in the article "Adhesion," where the decimal point has been placed after the values given for c, and which confuses the meaning. That this is an error is plain from the fact that it is omitted in the equation  $c \times t \times b$  560  $\times$  18  $\times$  99·68

over, written as 560; it is an absurdity. The greater portion of No. 1 is absorbed by "Agricultural Implements," a subject which is treated as fully as it deserves. There are few large farms upon which some of the more improved agricultural machines are not employed. Those of our readers who have visited our great national agricultural shows, cannot fail to have witnessed the large number of implements forwarded for trial, from the insignificant bruisers and pulpers to one of Howard's mammoth steam ploughing machines.

It might be questioned whether sin. z, and other abbreviations employed, can be strictly included under the head of "Algebraic Signs." We should consider many of those included under that title to be, correctly speaking, geometrical and trigonometrical signs. Considered as a whole, the subject is signs. Considered as a whole, the subject is treated in a most compendious manner. In our opinion, the brief notice of Mr. Byrne's dual arithmetic might have been omitted with dual arithmetic might have been omitted with advantage. It is utterly impossible to gain the slightest knowledge of the meaning of the symbols employed, from the few lines relating to them; and, as they are not explained, it is difficult to guess for what purpose they were introduced. At the same time, the whole principle may be hereafter fully explained with propriety under the head of "Arithmetic." Under the head of angle iron, the same disregard to classification is observable as that we have already noticed in "Algebraic Signs." classification is observable as that we have already noticed in "Algebraic Signs." In addition to sections of angle iron, others illustrative of channel, tee, sash, and numerous other forms, are also given. These, in reality, have nothing whatever to do with the title, and should be mentioned under their respectively distinct names, or included as a variety of the general species, "Iron." These little blemishes, which can "Iron." These little blemishes, which can be easily removed as the work progresses, do not detract from its intrinsic merit, nor interfere with the result aimed at by the publishers, which is to furnish the members of the profession, and the public generally, with a valuable book of reference and authority. Besides the vernacular names of the subjects appearing, they are also rendered into French, German, Spanish, and Italian. As will be expected, in many instances it is necessary to employ a paraphrase. The necessity for this is partly owing to the fact that there are many detail branches of engineering and mechanical industry, which, however common with ourselves, are not represented in other countries. In fact, it is not an uncommon occurrence for many of our own words to be adopted by the majority of the continental nations, with only the slight difference occasioned by individual pronunciation. The dictionary is abundantly illustrated by cuts and plates, and the get up of the numbers sustains the well-known reputation of the firm as scientific publishers.

# RATEABLE AND NON-RATEABLE MACHINERY.

A WORK on the principles of rating is not one which appears at first sight calculated to carry much interest with it to the majority of our readers. But on a closer

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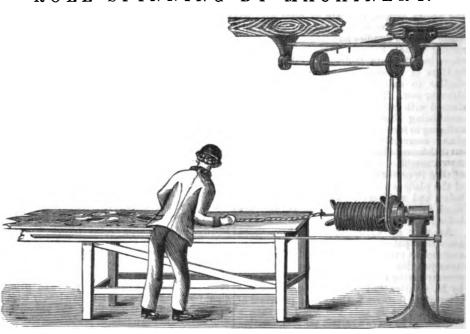
<sup>\*</sup> MECHANIOS' MAGAZINE, October 30, 1868. † "Spon's Dictionary of Engineering: Civil, Mechanical, Military, and Naval; with Technical Terms in French, German, Italian, and Spanish." London: E. and F. N. SPON, 48, Charing-cross.

inspection of the volume now before us,\* we have arrived at a very different conclusion, and, therefore, gladly draw attention of steam power users and others, having machinery on their premises, to some very important features in the work. "Penfold on Rating," is not a new work, the fourth edition having appeared in 1860. Since that date, however, no less than three Acts of Parliament bearing upon the subject of rating have been passed, besides which various important legal decisions have been given which materially affect the question. It was quite time that a new edition appeared, and a fifth has, there-fore, just been published by Messrs. Knight, which has been ably prepared by Mr. Kershaw, of 37, Norfolk-street, Strand, a surveyor of great experience, and an authority in all matters connected with the assessment of property. The present volume, there-fore, will be the means of throwing much light upon the application of a difficult and uninviting branch of the national economy, and will be of great assistance as a standard book of reference to the members of the various union assessment committees throughout England and Wales, in revising their valuation lists. But the points of the book to which we would invite the special attention of our readers, are those which relate to the rateability and non-rateability of the various classes of machinery. This question, which has of late given rise to a considerable amount of discussion, is very fully treated in Mr. Penfold's work, Mr. Kershaw having given special attention to it. He gives very concisely all the recent decisions of the Court of Queen's Bench on the subject. The work embraces practical considerations upon the principle of rating railway, gas, water and other companies, land tithes, buildings, manufactories and other properties, so that all are more or less directly interested in the matter upon which it treats. But we especially commend it to those who may occupy buildings in which machinery is fixed, and who do not know their exact legal position with regard to the rating of such machinery. They will here find all the information they require, with decisions of the judges both as to the rateability and the non-rateability of machinery.

# **TROLL SPINNING BY MACHINERY.**

A LITHOUGH roll tobacco, under one name or other has for or other, has for many years past been largely produced by our tobacco manufac-turers, it is a remarkable circumstance that until very recently only the most primitive process of hand spinning has hitherto been employed. In almost every other department of industry, machinery has long since superseded the slow and tedious process of hand manufacture. In this one, however, manual labour is even now, in some instances, employed—a piece of short-sightedness for which it is difficult to account in this boasted age of progress. Indeed, until a few months since, no change was ever attempted in the mode of procedure employed in the fabrication of roll tobacco. The first man who spun the first yard of pigtail ever manufactured in this country would perform his task precisely in a similar manner as some of his successors of the present day. He worked at a long, straggling, clumsy-looking table. At one end of this table there was a still clumsier and uglier looking kind of bobbin. This bobbin, actuated by a strap, was made to revolve by either a little boy or a little girl. These children worked like so many little galley slaves eight or ten weary hours daily-at their dreary, monotonous, and badly paid labour. Such was the condition of things at the tobacco factory of Messrs. Thomas Cope and Co., in Lord Nelson-street, Liverpool, when that

# ROLL SPINNING BY MACHINERY.



firm, with the praiseworthy view of ameliorating the evil, and, aided by an engine driver in their employ, effected a very beneficial alteration in this respect. The engine driver tried the experiment of turning the wheel by means of a piece of rope which was passed over a pulley on a shaft near the spinning table. The speed attained by this means was all that could be wished, and the bobbin was all that could be wished, and the bobbin was turned just as well as by a child. Messrs. Cope saw this, and determined that infantile labour should be superseded in their factory by engine power. To further this object, they at once employed a Mr. Hunter, a machinist, who soon worked out a simple system of cone pulleys and throwing-off gear, which was found to answer the purpose admirably. Soon after this, however, the new Factory Act came into operation, and the new Factory Act came into operation, and its regulations with reference to the employment of children were stringently carried out in the roll departments of tobacco factories. Manufacturers began to feel this anything but pleasant, and were aroused from their hitherto lethargic condition in the matter. interests were at stake, and they saw at once that some mechanical arrangement for turning the spinning-wheel had become absolutely necessary; in fact, could not, with any degree of convenience, be dispensed with. with these thoughts, Messrs. Cope were the first, we believe, to introduce a very simple system of overhead motion. With no other assistance than that afforded by pulley and strap, the speed of the wheel can be regulated so as to suit the different sizes of roll, and at the same time giving the spinner complete power over the rotary motion of the wheel. Messrs. Cope—to their credit be it stated exhibited their simple and effective invention for the benefit of the trade generally. The principles were found to be good, and, as a consequence, the system has been adopted by most manufacturers in the north of England. In the accompanying illustration, we give a perspective view of the spinning-wheel as it now works by the system of overhead motion, and which offers a marked contrast to the old style of working by a child. Messrs. Cope deserve every praise for the liberal manner deserve every praise for the liberal manner in which, in the interests of humanity, they have placed their arrangement at the disposal of the trade. The only wonder to us is that some such means were not devised long since, but it is not always easy to shake off settled habits and to get rid of antiquated ideas. However, Messrs. Cope have initiated a step in the right direction, which must now notens

volens be followed in all directions.

# ELECTRICITY AND TELEGRAPHY.

THE manufacture of the cable intended for the Persian Gulf has now been some little time completed at Mr. Henley's works at North Woolwich, and the whole of it coiled on board the ships "Calcutta" and "Tweed"—the major portion on board the former. The "Calcutta" left Gravesend on Friday, January 29, towed by a tug down Channel, and, on the following Friday, she proceeded on her voyage alone, but, as we now write, we have heard of a most disastrous termination to her voyage. On the Saturday night, she came into collision with a Prussian barque, which sank almost immediately; the "Calcutta" was so much damaged that she became almost waterlogged, and, to lighten her, the whole of the cable in the fore tank, about 70 miles, was run out, and the end buoyed. Some of the crew landed in ships' boats others were brought in; and there are fears that some of the men are lost, but at present it is impossible to say. It is hoped that all will be saved. H.M.S. "Terrible" and a tug left Plymouth in search of the vessel, and have just returned with the "Calcutta" in tow. The "Tweed," with the remainder of the cable, is all ready, and was appointed to leave this week, but, in the face of this awfully sudden catastrophe, it is not known what plan will be adopted.

The following is a satisfactory proof of the inreasing demand for telegraphy in America:-In 1867, the Western Union Telegraphy Company delivered to the press in that country 294,500,000 words of news matter, at a cost of 34 cents for a message of twenty words. This is at a cost of ene-fourth the ordinary rates. In the United States, the telegraph system is said to consist of 50,000 miles of line, 100,000 miles of wire, and 4,126 stations, and also 265 miles of submarine

A small vessel has been fitted out in America, A small vessel has been litted out in America, with the necessary picking-up apparatus, for recovering the lost Cuba cable. Sir Charles Bright has been with her for some time at Havana, and weather, it is understood, has delayed the operations. Our latest news, however, was to the effect that the vessel had been out and had returned to Havana with damaged out, and had returned to Havana with damaged machinery. If such should be the case, the recovery of the cable will be still further delayed.

A new frictional machine has lately been con-structed at the laboratory of the Sorbonne in Paris by M. Ferdinand Carré. On the same axis are mounted two discs of non-conducting material. The first, of gutta-percha, passes between two friction cushions, and is provided with a brass con-

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<sup>• &</sup>quot;Practical Remarks on the Principle of Bating." By CHARLES PENFOLD, Surveyor. Fifth edition, rewritten and extended by JOHN THOMAS KERSHAW. London: KNIGHT and CO., 90, Fleet-street. 1869.

uctor furnished with combs. The second disc is arger than the other, but is not provided with sushions—only with a conductor and combs. The action in the second is that of induction, and in surning the handle powerful results are obtained rom this machine; so much so, that with discs of rom 14in. to 19in. in diameter, sparks have been btained varying in length from 5in, to 7in.

On some land lines constructed in America, telegraph poles were used made of the following kinds of timber—chestnut, cedar, and locust. It was found that decay set in more rapidly with the chestnut than with the cedar, and with the cedar more than with the locust; in fact, at the end of five years, the locust wood was nearly sound, whils

the others were much gone.

The Secretary of State for War has issued instructions that in future the superintendence of the working arrangements of all permanent military telegraph stations, electric and visual, as well as the construction of military telegraphs, shall devolve on the Royal Engineers, who will in future consider this as one of their regular duties. All officers and others of the corps who may be selected omicers and others of the corps who may be selected will be required to go through a course of instruc-tion in electricity and telegraphy; and in the method of constructing telegraphs, in the School of Military Engineering at Chatham. Electricity has already for some time formed a part of the engineering instruction at Chatham. The lectures on the subject were delivered last year by Pro-fessor Fleeming Jenkin. The course this year is to be on "Practical Telegraphy," and will be given by Mr. R. S. Culley, the Engineer-in-Chief of the Electric and International Telegraph Company. The British Indian Submarine Telegraph Com-

pany, whose prospectus we lately noticed, has progressed satisfactorily. The share list has closed, and, after a good subscription, the general allotment has taken place. We hope to report in an early number some energetic measures for the

furtherance of this great work.

Messrs. Siemens have commenced to make at their works the submarine cable intended to be laid in the Black Sea, from the Crimea to the Asiatic coast, forming part of the new Indo-European Company's overland line to Teheran.

A scheme was brought forward some few years

since for the establishment, at various necessary points, of light vessels, provided with means for rescuing life, and a system of signals, so that signals from vessels might be received and forwarded to the nearest point of land, by means of submarine cables from the vessel to the shore. It appears this scheme has again been brought forward, and is supposed to be under the consideration of the Government and the Trinity Board, the object being to moor floating telegraph vessels in the Channel, first, between the Scilly Isles and Ushant, and, subsequently, at the southern entrance of St. George's Channel, and of the extremities of Ireland. Communication is to be maintained with the nearest point of land by means of submarine cables. In addition to providing a means of communicating with the shore, it is proposed to make the vessel a sort of landing stage for passengers, so that people might disembark there, and reach the shore by local steamers plying to the nearest port; in addition, it is intended to store the vessel with the most needful of provisions, &c., so that the wants of windbound homeward vessels might be relieved.

In most of the places mentioned, the water is not too deep to admit of a vessel being moored, but as in each case it will be in a tideway, it will be necessary, for safety, to moor her so that she could always swing to tide, with a strong chain safely and securely moored in a manner similar to our light vessels. There is but little fear of a well-built suitable vessel riding out very severe gales; but so far as is at present reported, we are unaware how it is intended to arrange the submarine cable; this would in all probability hang down in a curve towards the bottom. The shifting of the vessel when she swung round to the different tides would infallibly kink the cable, and finally cause its breaking, if the friction it received on the bottom had not brought about a similar ending. By a peculiar system of attachment to the mooring chain and moorings, it is possible to obviate, in a great measure, these evils, but the practical experience already gained of submarine cables hanging from a ship for a continued length of time is decidedly against their lasting.

The manufacture of the French Atlantic cable is steadily and satisfactorily progressing at the cable works at Greenwich and at Woolwich. At the present time, about 1,400 miles have been manufactured at the former works, and 350 miles at the latter, making a total of 1,750 miles. Shipping on arrive at.

board the "Great Eastern" has been going on for some time; two vessels have already left the works at Greenwich, and discharged their cargo, mile by mile, into the "Great Eastern"; a third cargo, in the contractor's vessel, the "Scanderia," will leave in a day or two. The total amount of cable on board the "Great Eastern" is 740 miles.

OTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-NOTES PLICATIONS.

POISONED SOCKS AND STOCKINGS-MAGNETISM OF MOLTEN CAST IRON--COMBUSTION UNDER PRES-

SOME of our readers may remember a Mr. Webber appearing before the Lord Mayor to give publicity to the fact that stockings dved with a certain red dye produced, when worn, very severe irritation of the skin, somewhat difficult to cure. Cases of this kind have come under the notice of several medical practitioners, and within the last few days advertisements have appeared in the daily papers announcing the formation of a committee to investigate the subject of "sock and shirt poisoning." The work has already been done for them in Germany and France, where similar cases have been observed. In the former country, Dr. Bidard, after a full investigation, and, since then, M. Tardien, of Paris, have come to the conclusion that the cause of the mischief is corallin or coraline (from the colour of coral). This dye was first prepared by Wurtz from carbolic acid, and a process for its production was afterwards patented by MM. Guinon, Marnas, and Bonnet. It is made by first treating carbolic acid with oxalic and sulphuric acid, and afterwards with ammonia. The colour is probably rosolate of ammonia. Whatever it may be, however, dandies and girls of the period have suffered severely from wearing silk socks and stockings dyed with it, and its use should be discontinued. It does no internal mischief, but applied to the skin brings out a pustular eruption It may be that a new ccunter-irritant has beendiscovered which the doctors will appreciate.

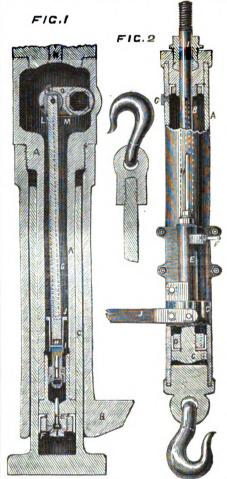
An ordinary magnet loses its magnetism when heated. But molten cast iron, surrounded with a helix, through which a strong galvanic current is sent, becomes strongly magnetic, and retains its magnetism as long as the current is continued. This fact has been discovered by M. Treve, who draws some important inferences as regards the

magnetism of the earth.

Some time ago, we laid before our readers Dr. Frankland's views of the cause of luminosity in a flame. In opposition to Davy's opinion, that luminosity nosity depends upon the incandescence of solid particles, Dr. Frankland asserts that it is a consequence of the density of the atmosphere surrounding a flame. We need now only mention one experiment which is thought conclusive. The flame of pure hydrogen, which is barely visible at the ordinary pressure of the air, becomes more and more luminous as the atmosphere in which it is burning is compressed.
M. Deville does not accept Dr. Frankland's conclusion. Pressure, he says, means elevation of temperature, and luminosity depends upon temperature. It is not our intention to enter upon this discussion here, and we come at once to a practical application. Pressure meaning elevation of temperature, M. Deville suggests that the furnaces of engines might be supplied with air under pressure, in which case the products of combustion passing slowly through tubes at a much higher temperature than under ordinary conditions, the extent of the heating surface might be greatly diminished. The application to marine boilers when heated with liquid hydrocarbons is particularly mentioned, and is, perhaps, within the range of possibility. Double work, however, it must be remembered, is imposed on the steam, and the requirement of an extra boiler might counterbalance the advantages of a diminished heating sur-We look forward with much interest to the results of M. Deville's labours. He has had an iron room constructed in which he can carry on furnace experiments under a pressure of two or three atmospheres, and we sincerely hope that no accident may happen to prevent him from giving to the world the valuable results he is likely to

# HYDRAULIC LIFTING AND PULLING

WE herewith illustrate some improved forms W of hydraulic jacks, which were designed by their manufacturer, Mr. J. P. Baragwanath, of 200, Upper Thames-street, London. Fig. 1 represents a vertical section of the lifting jack, from which it will be perceived that the ram A is protected by an outer casing B, which prevents any grit or dirt getting into the working parts. At the bottom end of the casing B a claw is attached the bottom end of the casing B a claw is attached for lifting loads from the ground. The head of the ram forms the reservoir. On raising the plunger D the valve opens and allows the water to flow through into the pump, and closes on depressing the handle, at the same time forcing the pump full of water through the lower valve the cylinder C, thus raising the ram with its load through a space equal to the pump full of water distributed over the area of the cylinder. In lowering the ram, the valves are both opened by withdrawing the handle a little in the socket, so as to allow the projection on its end to clear the stops on the head of the ram, and then depressing the lever down to its full extent; by so doing the bonnet at the bottom of the plunger D presses on



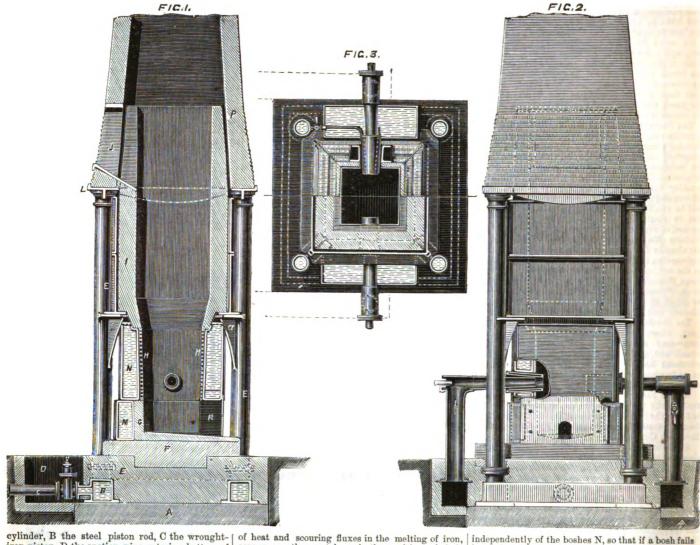
the valve F and opens it, allowing the water to flow upwards. At the same time, the pin I presses against the valve in the plunger D, and opens a passage for the water back into the reservoir, which is then ready to be pumped into the cylinder again for a further lift. Having dispensed with all spiral springs, and made the machine as simple as possible, there is no chance of the working parts being put out of order by rough usage. The valves and working parts can be readily got at by unscrewing the top of the head, and all the interior working parts can be drawn out for examination. These jacks are made in sizes to lift from 5 to 40 tons, the smallest weighing 55lb., and the largest 200lb. They lift at double the speed of the best screw jacks, and are quite safe in lifting and lowering. The advantages claimed by the inventor are protection and simplicity of the work-ing parts, lightness, speed in lifting and lowering, and the small amount of manual power required in working them. They are in use on several railways, and at the works of some of our leading ship builders, engineering and boiler makers,

where they are deservedly appreciated.

At fig. 2 is seen the pulling jack in vertical section. In this tool, A is the wrought-iron

#### IMPROVED SMELTING FURNACE.

BY MR. JOHN THOMAS.



cylinder, B the steel piston rod, C the wrought-iron piston, D the suction pipe entering bottom of the cylinder, E a force pump bolted to the cylinder, F the cock for lowering the cylinder, G the filling hole, H a delivery pipe entering the top of the cylinder, I the stuffing box for the piston rod, and J the lever for the handle to fit on for working the pump. The jacks are shown in position ready to pump. The jacks are shown in position read, be lowered to attach a load. To operate it, first be lowered to attach a load. To operate it, first open the cock F, and on pressing the handle of the pump down to its full extent, it opens the delivery valve of the pump (which is not shown). This allows the water on the upper side of the piston to pass through the delivery pipe H, through the delivery valve in the pump, and through the cock F into the suction pipe G, which enters the cylinder just at its bottom. The weight of the machine is sufficient to force the water from machine is sufficient to force the water from the upper side of the piston to its under side, when the cylinder is lowered to the depth required; next shut the cock F and attach the load to the lower hook, and on working the handle the load is hoisted. The load can be lowered at the load is hoisted. The load can be lowered at any speed required by partially or fully opening the cock F; when the load is hoisted, the machine will support the suspended load for any length of time. These jacks are made to lift from 2 to 15 tons; the smallest weighs only 50lb., and the largest 180lb. They are found useful by marine engineers, marry of whom have adopted them for lifting, available, covers and published the states. lifting cylinder covers and pulling-out pistons.

They are also useful for many purposes on board ship, such as stretching shrouds, rigging, &c.

These jacks are well worthy the attention of those firms who are not yet using them, as effecting a great saving in time in the many operations to which they are applicable.

# IMPROVED SMELTING FURNACE.

THE chief object of the invention illustrated in the annexed engraving is to construct air or blast furnaces which will the better withstand the action

or heat and scouring fluxes in the melting of iron, copper, or other metals, or in the smelting of their ores. The main features of this invention, which has been patented by Mr. John Thomas, of Newcastle-upon-Tyne, in addition to the general arrangement of the parts, are the construction of water boshes, and the employment of spikes on the water boshes. Our engraving shows, at fig. 1, a sectional elevation; at fig. 2, a similar view at right angles; and at fig. 3, a sectional plan of one of these furnaces;

For a cupola or blast furnace, Mr. Thomas first makes a foundation A, and fixes therein a water pipe B, which passes completely round the furnace, except makes a foundation A, and fixes therein a water pipe B, which passes completely round the furnace, except at the front. There is a branch C to this pipe to let the water in, the branch being provided with a valve and a valve well D. There is also a branch at each corner of the pipe upon which is fixed the hollow columns E E. These columns are closed at the top, and an entablature is fixed on them on which the chimney is built. The water is let into the foundation pipe B from a high level so as to rise and fill the columns E E, the use of the columns being to hold water and carry the chimney. Brackets a a are cast on the columns to carry the plates O, which hold the upper brickwork of the furnace. Upon the foundation, Mr. Thomas builds as usual up to the bottom of the furnace, as shown at F. He then places water boshes M M, of cast or wrought iron, all round the furnace, except at the front, where there is a door R, as is usual in cupola furnaces, or a dam, as in blast furnaces. These boshes are set back 4½in from the face of the furnace inside, to allow of a thickness of lining G of firebrick. He then places another tier of water boshes N above those just described; these upper boshes go all round the furnace, or an all four sides. They have spikes h heart all another tier of water boshes N above those just described; these upper boshes go all round the furnace, or on all four sides. They have spikes b b cast all over their inner sides similarly to ironfounders' loam plates; these spikes may be of any suitable length, but  $1\frac{1}{2}$  in. is found to be sufficient for most purposes. The upper boshes against the spikes are lined with stiff mortar H H, made of refractory material, such as ganister and fireclay, or road grit and fireclaye On the brackets a a of the columns are placed the iron plates O O, which enclose the four sides. These plates reach nearly to the charging door J of the furnace. On the bottom edge of these plates there is a flange for carrying the brickwork I of the furnace,

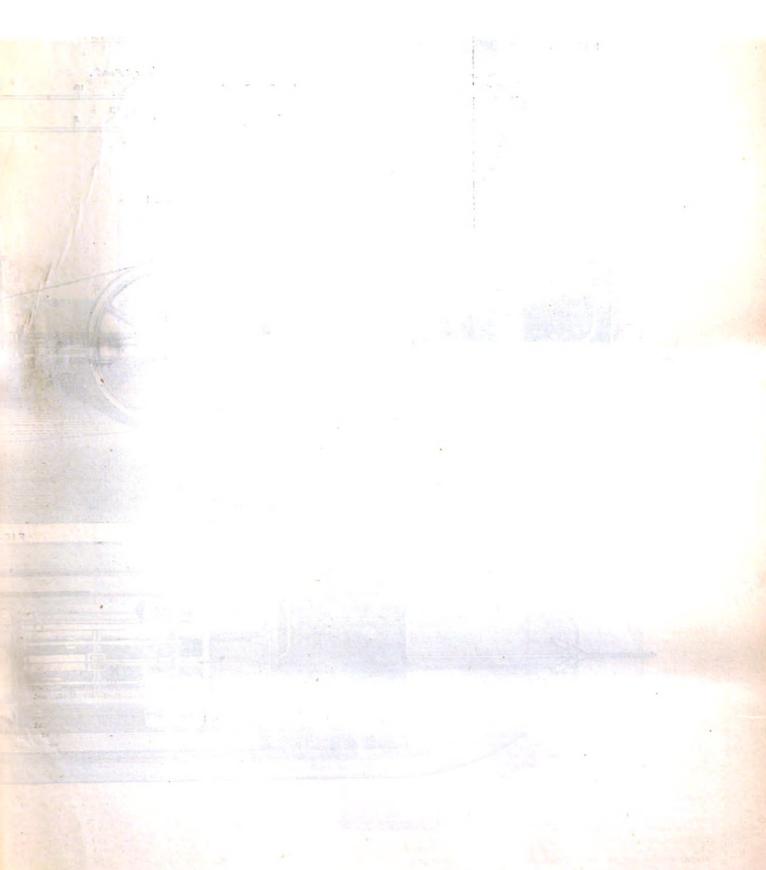
independently of the boshes N, so that if a bosh fails

independently of the boshes N, so that if a bosh fails it can be taken out and another introduced without pulling down the brickwork.

The inside of the furnace is next built up from the top of the boshes with firebrick or other refractory material. The boshes M and N are filled with water drawn from the columns E E by a pipe connected with the bosh and the columns; each of these pipes has a tap to regulate the supply. A hole is cast through the side boshes for inserting the tuyeres cc; there are water tuyeres also supplied from the columns E E, as shown in fig. 3. The inside of the furnace is similar in form to a blast furnace, larger at the upper part than at the bottom, and the crucible or lower part is made tapered. This form of furnace is best adapted to hold up the material under treatment, in order that it may be melted above the blast, and fall like rain drops, and gravitate through the fluxes. If desirable, the lower boshes are spiked and brought forward to the face of the furnace, and lined against the spike the same as the upper boshes. The principal novelty in this invention is the spiked boshes which hold up the lining, which cannot be fluxed away on account of the water in the boshes, keeping the back of the lining comparatively coal. boshes which hold up the lining, which cannot be fluxed away on account of the water in the boshes, keeping the back of the lining comparatively cool. For air or reverberatory furnaces for smelting copper or other ores of metals, the bed of the furnace is built in the usual way up to within 4in. or 6in. of the bottom. The spiked water boshes are then set around the sides and bridge of the furnace, and the spikes lined up against, as in the cupola or blast furnace. For a puddling furnace for puddling cast iron into wrought iron, the spiked water boshes are set round the sides and bridge of the furnace, as in the copper smelting furnace.

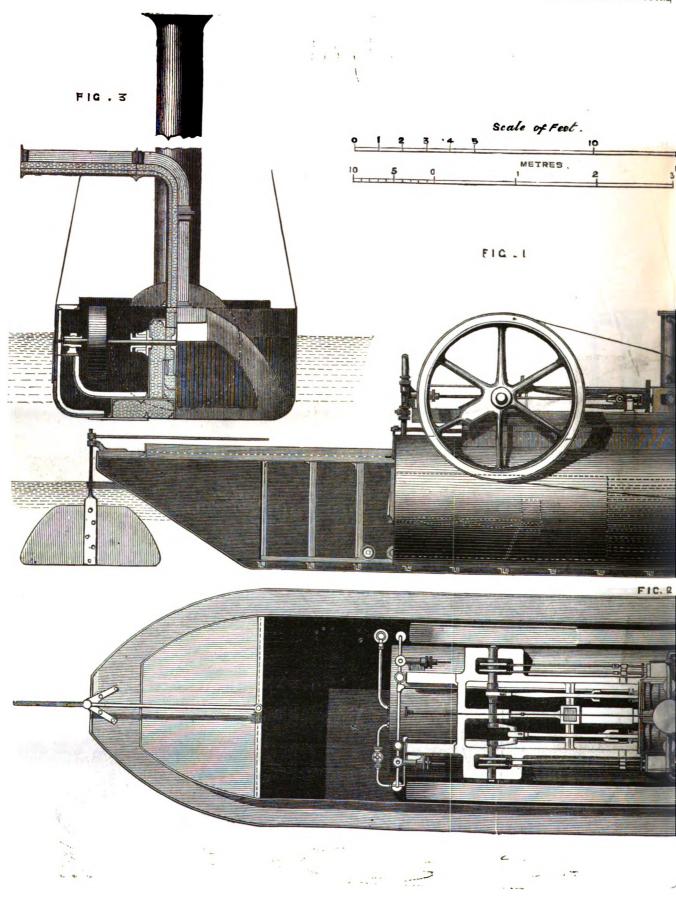
The champion ploughing match of the West Auckland Society took place on Tuesday week on a stiff loamy soil. Twenty-seven men competed for the prizes, and some excellent work was shown. All the prizes in the champion class—indeed, all the prizes in the field, with the exception of one third prize—were won with Messrs. Ransomes' ploughs. This makes the fourth match this year at which Messrs. Ransomes ploughs have, in local hands, carried off all the prizes in All England classes.





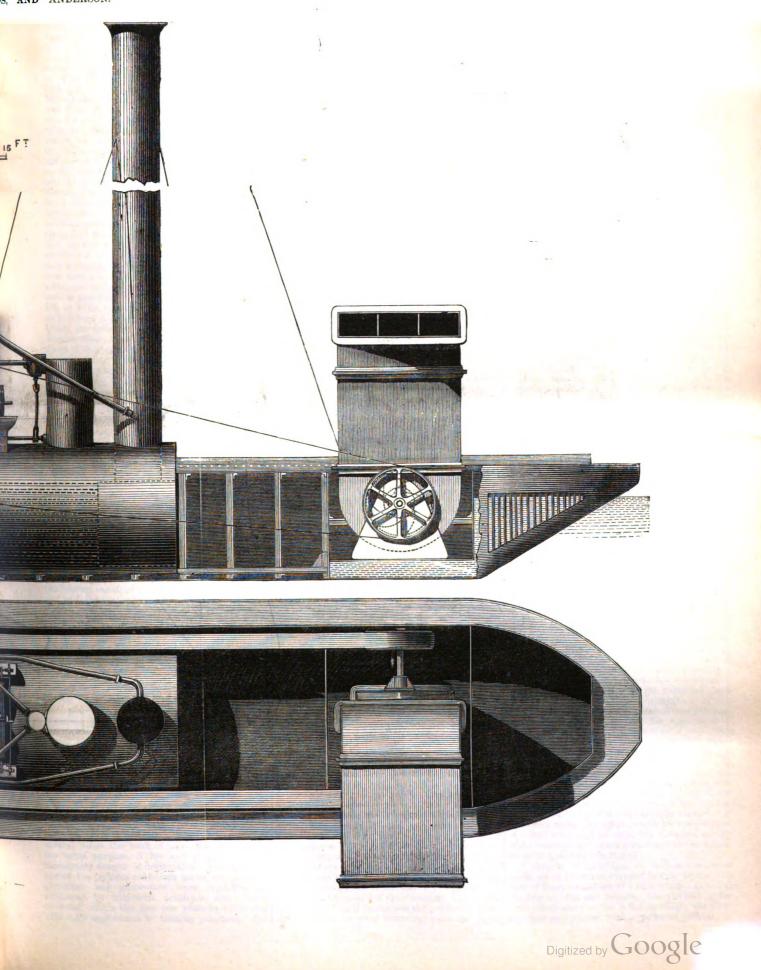
# FLOATING CENTRIFÜ

BY MESSRS. EASTONS,



# L DRAÍNAGÉ PÚMP.

S, AND ANDERSON.



## FLOATING CENTRIFUGAL DRAINAGE PUMP.

THERE are very many moderate-sized tracts of land in this country, and especially in Holland, which, if freed from the waters covering them would be valuable property. The cost of fixing pumping machinery powerful enough to effect this object deters even enterprising men from making any attempts, especially as the soft and even marshy nature of the ground generally renders the expense of works requiring solid foundations very uncertain. With a view to overcoming this diffi culty, the novel application of the Appold centri-fugal pump, of which we give a double page illustration, was designed by Messrs. Eastons, Amos, and Anderson, of London and Erith. Into a pontoon 52ft. long, 10ft. wide, and drawing 4ft. of water, is laid a very strong Cornish multitubular boiler, 21ft. long, and 5ft. 6in. diameter, with a 3ft. 6in. flue, and 4in. iron tubes. Upon a wroughtiron framework riveted to the back of the boiler is laid a pair of non-condensing engines, with 12in. cylinders, 20in. stroke, provided with double slide valves for variable expansion. The flywheels of the engines act as driving pulleys, and transmit the power through two 10in. belts to the pulleys on the spindle of the centrifugal pump, the fan of which, of the true Appold proportions, 2st. 7in. diameter, revolves in a wrought-iron case bolted to the bottom of the pontoon. The inlet pipes of the pump, also formed of wrought iron, descend to and are connected with a sort of false bottom, which opens into the bulkhead at what may be called the bow of the craft, which, though it have the semblance of a spoon-shaped bow, is in reality only a grating in disguise, the bulkhead being the true termination of the boat. The object of this arrangement is to get a horizontal inlet at as low a level as possible. The delivery pipes are sheet iron, 5ft. by 1lin., and are made in various lengths, so as to set up foot by foot as the level of the water sinks, the delivery finally being by a bend into wooden shoots over the nearest embankment. The speed of the engine varies from 80 to 116 revolutions per minute, according to the lift. The steam enters the cylinders at pressures varying according to the lift, up to 120, and is cut off at 3in. of the stroke, or about one-seventh, the exhaust steam being conveyed through a tubular feed-water heater and by means of a ring blast and petticoat, into the chimneys. The pump raises fifty tons of water per minute—a mighty stream to issue from a machine the proportions of which make it appear inadequate to so much work.

At a trial of one of these floating pumps, the engine made eighty-five revolutions, the lift was 6ft. 6in., steam 90lb., cutting-off at 3in., and the consumption of fuel was only 160lb. per hour. Under this high pressure and very sharp cut-off the engines worked very smoothly, and the whole the consumption of the state of the engines worked very smoothly, and the whole the consumption of the state of the apparatus appeared eminently adapted for its purpose. When in actual use it is steadied between six poles, which carry the shoots and a temporary roof to keep off the weather. When the land has been pumped dry either a dam is constructed round the pump and water let in to float it into the nearest canal, or the machinery is taken out, and with the boat, which only weighs about 91 tons, taken overland to its next field of operations.

## EXPLOSIVE COMPOUNDS FOR ENGINEER-ING PURPOSES.

By Mr. Perry F. Nursey. (Continued from page 106.)

THE most powerful opponents with which gunpowder apparently has to contend, are nitro-glycerine and gun-cotton, and this on account of the extraordinary amount of power they possess; indeed, under certain conditions, they develope an almost irresistible force. But it is just this attribute of resistless violence which has hitherto rendered them the most unsafe, the most dangerous compounds that can be applied to practical purposes Man loses all control over these agents, inasmuch as an accidental blow or a slight concussion may—nay, must--produce a violent and perhaps most disastrous explosion. It is of no avail to possess a material which does several times the work of any other adapted for the same purpose, if life and property are in momentary danger of destruction. That this was momentary danger of destruction. one of the perilous conditions under which nitroand gun-cotton were employed, is evidenced by numerous accidents which have the dangerous nature of their contents led to the occurred within the last few years in connexion with their application to blasting purposes. But strongly with the peril attending even the mere

both these dangerous agents have within the last twelve months been brought under control, and their action has been so modified that they may now be said to possess all the conditions necessary to constitute a safe and highly efficient material

for blasting purposes.

Taking them in the order in which they are referred to above, let us first examine the merits and demerits of nitro-glycerine, which is one of the most remarkable materials employed to replace gunpowder as a destructive agent. This substance was discovered by Sobrero, in 1847, and is produced by adding glycerine in successive small quantities to a mixture of one volume of nitric acid of sp. gr. 1.43, and two volumes of sulphuric acid of sp. gr. 1.83. The acid is cooled artificially during the addition of glycerine, and the mixture is afterwards poured into water, when an amber-coloured oily fluid separates, which is insoluble in water, and possesses no odour, but has a sweet pungent flavour, and is very poisonous, a minute quantity placed upon the tongue producing violent headache, which lasts for several hours. The liquid has a specific gravity of 1.6. and solidifies at about 5deg. Cent. (40deg. Fah.); if fame is applied, nitro-glycerine simply burns; and if placed upon paper or metal, and held over a source of heat, it explodes feebly after a short time, burning with a smoky flame. If paper moistened with it be sharply struck, a somewhat violent detonation is produced.

In 1864, Mr. Alfred Nobel, a Swedish engineer, as an explosive agent. Some experiments were, in the first instance, made with gunpowder, the grains of which had been saturated with nitroglycerine. This powder burnt much as a management, with a large state of the saturated with nitroglycerine. glycerine. This powder burnt much as usual, but with a brighter flame, in open air. When confined in shells or blast-holes, greater effects were, however, produced with it than with ordinary gundered with the state of the stat powder; its destructive action is described as having been from three to six times greater than that of powder. The liquid could not be employed as a blasting agent in the ordinary manner, as the application of flame to it from a common fuse would not cause it to explode. But Mr. Nobel has succeeded, by employing a special description of fuse, in applying the liquid alone as a very powerful destructive agent. The charge of nitro-glycerine having been introduced, in a suitable case, into the blast-hole, a fuse, to the extremity of which is attached a small charge of gunpowder, is fixed immediately over the liquid. The concussion produced by the exploding powder, upon ignition of the fuse, effects the explosion of the nitro-glycerine. The destructive action of this material is estimated to be about ten times that of an equal weight of gunpowder, so that if we take 32,000lb. as the average of work done by 1lb. of gunpowder, as stated in the early part of this paper, we get 328,320lb., or about 146½ tons, as the work done by 1lb. of nitro-glycerine. the work done by 1lb. of nitro-glycerine. Therefore, although its cost is about seven times that of blasting powder, its use is attended with great economy, more especially in hard rocks, a considerable saving being effected by its means in the labour of the miners, and in the time occupied in performing a given amount of work, as much fewer and smaller blast-holes are required than when gunpowder is employed. The material appears to have received considerable application in some parts of Germany and in Sweden; but, in England, it has not progressed beyond the stage of experimental trials.

Although nitro-glycerine appears to possess ery important advantages over gunpowder as a blasting and destructive agent, the attempts to introduce it as a substitute for gunpowder have been attended by most disastrous results, ascribable in part to some of its properties and the evident instability of the commercial product. The explosion which occurred on board the West Indian Company's steamer "European" will long be remembered by many. This distressing event happened on April 3, 1866, when the "European' was unloading her cargo alongside the railway company's wharf at Aspinwall. The force of the explosion was such as to tear away the upper a ts of the ship, and to blow the plates off her sides. The wharf, too which was some 400ft. in length, was literally torn to pieces, and about fifty persons killed, whilst many others were periously injured. By the ship's bills of lading a number of cases of nitro-glycerine were proved to have been on board, and doubtless careless handling of these packages by men who were ignorant of

transport of this destructive agent, another accident occurred on the 16th of the same month. oil-stained boxes, each measuring about 4 cubic feet, arrived at San Francisco by the Pacific mail steamer. They were removed from the ship into the city, in which they had no sooner been deposited than they exploded with a violence that shook the neighbourhood like an earthquake for a quarter of a mile around, and proved terribly fatal to human life. It was publicly stated that the boxes contained nitro-glycerine, which was intended for sale to the mining companies in Nevada, Idaho, and Colorado. In Sydney, New South Wales, too, a tremendous explosion occurred on March 4, 1866, in the stores of Messrs. Molison and Black, in Bridge-street, which were totally destroyed. The noise of the explosion is said to have very much resembled the discharge of artillery, whilst a column of the debris was thrown to a height of about 150ft. A great amount of damage a height of about 150tt. A gross-mount was done to the surrounding buildings, and proexplosion was traced to two packages of nitroglycerine.

There is vet another danger attending the substitution of nitro-glycerine for gunpowder in mining, and this relates to its manipulation when being prepared for firing a shot. Although the oil may have been safely transported to its destination, there is no guarantee that its destructive energy will not be developed before it is placed in the hole which is intended for it. Indeed, there are instances on record which show how slight a circumstance serves to spread death and destruction around, even in the handling of this material. It should be observed that among other disadvantages, nitro-glycerine freezes at a somewhat high temperature, in which condition mere friction will explode it. A sad illustration of this fact occurred in 1867 at Hirschberg, in Silesia, where nitro-glycerine was being used in the boring of a railway tunnel. The oil was one day found to be frozen, and in this state was delicately handled, and fragments were detached by means of a piece of wood. In the bore holes the frozen nitro-glycerine exploded quite as well as the fluid. One day and overseer attempted to break up a lump of the frozen material with a pick. The result was a violent explosion of the whole mass, which caused that the incautious miner. Several acceptance the dents have also occurred in our own country since the introduction of nitro-glycerine, and many of those who were the first to experiment with it have already given up its use. This material, therefore, worthy of utter condemnation for its fearfully dangerous and uncertain character, even under the most favourable circumstances. resistless energy is jully admitted, and its great value in this respect for mining operations duly recognized: but inasmuch as it does not appear that there are any conditions under which it can be handled with safety, its use ought certainly to be everywhere prohibited.

Such being the dangerous character of nitroglycerine, it is satisfactory to turn to this material in its modified condition. We will now consider this hitherto uncontrollable agent of destruction in a new form, in which it is comparatively harmless, and absolutely far safer to handle and transport than gunpowder. After long and patient experimental research, Mr. Nobel, painfully impressed with the danger attending the use of nitro-glycerine in its ordinary condition, succeeded in effecting a new combination, in which this treacherous compound is rendered perfectly innocuous, except under the actual conditions of work. To this new substance Mr. Nobel has given the very expressive name of "dynamite." It consists of fine gravel saturated with nitro-glycerine, in which condition it presents the appearance of coarse brown sugar. In July last some interesting experiments were carried out with this substance at the Merstham Greystone Lime Works, near Red Hill, Surrey, at which the author was present. So important were these experiments as bearing on the subject of the paper, that the author will here give their details from notes taken by him at the The object of the experiments was to illustrate the perfectly safe and harmless character of dynamite under any other conditions except those of actual work, and to show its resistless energy when confined and fired according to the speci mode proposed by Mr. Nobel.

A number of cartridges of various sizes were made up of dynamite wrapped in thin paper. To each of them was attached a fuse which burned at the rate of 18in. per minute. On the end of the fuse, which was inserted in the cartridge, was fixed a copper cap primed with a powerful detonating compound, and to which is due the development of the explosive energy of the dynamite. A charge of half an ounce of dynamite was first exploded on an oak plank about 6ft. long, 9in. wide, and 2in. thick, and supported at each end. An exceedingly loud and sharp report ensued, and an examination of the plank showed that the charge had taken effect completely through the board, the under side being rent and splintered. A similar charge was then fired on a balk of fir timber placed flat on the ground. A deep indent was made in the timber, and one side was splintered off. To prove the harmlessness of the dynamite when fired by an ordinary light, Mr. Nobel cut a cartridge in two and lighted one half in his hand with an ordinary fuse. It burned quietly and quickly, but not rapidly, out. The remaining half of the cartridge was then fired with a capped fuse, when a violent detonation resulted. The absence of all danger in case of collision or fire during transport or storage was then demonstrated in a most marked manner A small deal box, containing about 8lb. dynamite, was thrown down from the top of a cliff about 70ft. high, upon a hard bed of rock The concussion started the joints of the box, but the contents remained uninjured and unchanged. The test of fire was then applied to a similar box to the last, containing the same quantity of dynamite. A fire was kindled, upon which the box was placed, and after a few minutes the box quietly turned over on one side, a gentle puff of smoke and flame issued from it for a few seconds, and 8lb. of one of the most violent of modern explosives were almost noiselessly dissolved into air. The charred and blackened box was removed from the embers, and on examination the joints were found to be sound and whole. The author examined this box of dynamite before it was nailed down and placed on the fire, as also the one which was thrown down the precipice after the occurrence, and therefore writes from his own knowledge of the matter. Such tests ought to satisfy the most sceptical of the safety of the new blasting powder either in a railway collision, or accidental upset of a package, or a fire.

accidental upset of a package, or a fire.

The next point was to test the power of the dynamite when under conditions of partial and also of perfect confinement. To this end, about 40z. of dynamite were placed upon a block of granite measuring 3ft. by 2ft. 9in. by 2ft., the dynamite being only covered in with a lump of clay and a shovelful of gravel. A very loud report followed, and on examining the stone it was found to be traversed by rents and fissures. large masses to be traversed by rents and fissures, large masses being easily detached by a crowbar. The effect certainly surprising, considering the comparatively loose and unconfined condition of the charge. In the next experiment, a cynnurical block of wrought iron, about 12 in high and In the next experiment, a cylindrical 10½in. in diameter, and having a lin. hole bored through the centre, was used. The bore hole was but not rammed tightly—with dynamite. and fired. A report soon followed, remarkable for its penetrative loudness, and on examination one half of the cylinder was found about 80ft. from the place where it originally stood, being then only stopped by a grass embankment. The other half was found some 50ft. in an opposite direction, lodged against a pile of broken rock, which stopped its further progress. The iron showed a clean split, which revealed an excellent quality of metal. bore showed an extraordinary enlargement near the centre, measuring nearly 13in. across, whilst the measurements at the top and bottom of the bore were in each case lin., as before firing. It would appear that the power developed increased as it approached the centre of its length, becoming reduced again as it neared the further end of the hole although of course the explosion was practically instantaneous. Both ends of the bore were open to the atmosphere, there being no plugging nor tamping The strain on the metal must have been enormous to have thus compressed it around the centre of the bore, and to have rent such a mass and sent its halves yards away in opposite directions.

Although not strictly within the scope of the paper, it may not be uninteresting here to notice the experiments illustrative of the application of this powerful agent of destruction to military purposes. Dynamite is of course unfitted for use either in beavy guns or small arms, its very power being against it in this respect, as forcibly illustrated in the experiment with the cylinder. But it can be utilized in shells with great advantage. A time fuse fitted with the detonating cap would effect its explosion at the proper moment, whilst, if the shell broke up in the gun, no harm would result, as demonstrated by previous experiments.

he fairly met the point by filling a tin case with 411b. of dynamite, and firing it behind a piece of ratio of dynamice, and firing it behind a piece of curved in wrought-iron plate, 2ft. high and 3ft. long, measured round the curve. The plate was broken into four unequal parts, which were blown considerable distances away. The face of the plate upon which the powder had acted was completely pitted with small below doubtless to the atoms. pitted with small holes, due doubtless to the atoms of silica in the dynamite. This experiment satis-factorily demonstrated the great velocity which would be imparted to fragments of shells charged with this explosive.

The next experiment was directly illustrative of the present subject—that of blasting rock. Here a charge of 12lb. of dynamite was inserted in a vertical bore hole 15ft. deep and 2in. in diameter tamped with sand. The explosion was indicated by a low subterranean thud and a perceptible stremour of the surrounding land, even at a considerable distance from the blast. The rock showed a series of fissures which indicated that an enormous mass had been loosened, and was ready to be detached by the pick. Had the rock been of a harder and less friable nature, it would have offered a greater amount of resistance, and the whole mass would doubtless have been blown This was the case with some granite quarries out. at Stockholm, where an immense mass was de tached by a charge of dynamite, and thrown down in huge blocks. On the present occasion, a further charge of 41lb. of dynamite was fired at the same depth as the last, with proportionate results. One of our members, Mr. A. E. Walton, who was present at the experiments, and who is constantly engaged in blasting operations, affirmed that the results greatly exceeded his expectations, considering the comparative smallness of the charge. The method of charging in dry ground was next illustrated by filling a glass tube with a series of cartridges which were tamped with loose sand and This experiment was repeated with water tamping to illustrate the mode of operation in wet A striking effect was produced by firing ground. a cartridge in a bucket of water. The detonation appeared to be stronger than under any other conditions; the bucket was shattered, and fragments were picked up several hundred feet from the spot where the charge was fired.

It will thus be seen that the most severe tests for fety failed to show that any danger was pr in this material, whilst, on the other hand, there was no condition under which its violence was not developed when fired with a detonating fuse. So far, dynamite appears to be well calculated to supersede gunpowder for blasting purposes. only point of doubt which has arisen in the author's mind is whether any mechanical or chemical change might not occur in the course of time. which would render dynamite as dangerous as nitro-glycerine. The author recently made this objection to Mr. Nobel who, however, stated that there was no fear of such an occurrence, inasmuch as he had had dynamite in store for very lengthened periods, subject to high temperatures, and that it retained its original condition under some very trying tests. The stability of dynamite has been practically confirmed by extensive and daily use in various mines, and by the large quantities which are stored at the factories. Beyond this the most eareful investigation has shown that there is not the slightest ground for apprehension on that Under continued exposure to the direct rays of the sun during the whole of last summer, not the slightest chemical changes could be detected, and the same was the case with some dynamite exposed for forty days to a heat varying between 150deg, and 200deg. Fah. All nitrated. or rather hyponitrated organic compounds are liable to spontaneous decomposition—or what is understood by this backneved and ridiculous term unless they are completely rid of free adhering tric acid. The reason is that the free acid will nitri**c a**cid. produce a local decomposition, which sets hypo nitric acid free, the latter producing a new local decomposition, and so on until sufficient heat is evolved to set fire to the compound. is no difficulty whatever in ridding dynamite of free acid, but in the case of cotton or any other fibrous substance the utmost care is required, as free acid will sometimes adhere in spite of repeated washing.

In order to bring the matter down to the present time, it may be as well briefly to note the progress dynamite has made since the experiments at Merstham were carried out. In Germany, depots have been established in every mining district throughout the country, and the sale is rapidly spreading. In fact, there are but few mines in the north of Germany which are not more or less The danger attending the use of a shell was too north of Germany which are not more or less times the beaten track of our engineering predegreat to allow of its adoption by Mr. Nobel, but using it and if it has not as yet become as general as cessors, and exploring new fields wherein to exercise

gunpowder, it is owing only to the slow and sure system peculiar to the German race. The best proof, perhaps, of the great ascendency of dynamite in Germany is the circumstance that a firm at Cologne, who are the largest manufacturers of blasting powder in Western Prussia, have become converted to dynamite, and have taken up its agency. In Sweden, Mr. Nobel informed the author, that there was some difficulty in prevailing on the miners, who had become used to nytroglycerine, to use dynamite. But since the prohibition of the liquid explosive in that country, in September last, the sale of dynamite has been much larger than that of nytro-glycerine used to be. Sweden consumes at present nearly as much dynamite per month as Great Britain does in a year, which only proves the want of organization which has hitherto stopped its progress in this country. In Norway, the consumption of dynamite is not very large (from about 35,000 to 40,000lb. a-year, the author is informed), but it is steadily increasing. In California, dynamite is in great favour, and is transported by rail without any restriction. In the Eastern States of the American Union the miners still continue to use nitroglycorine, chiefly because dynamite has not been manufactured and sold there. In England, comparatively little dynamite has been used until This is owing to the difficulties of and to the fact that Mr. Nobel has transport, hitherto directed his attention to its manufacture and sale upon the Continent. There is but one There is but one depôt for the whole of Great Britain, and that is situated at Carnarvon. As, however, dynamite is not carried by rail, a great many orders are not executed. Still, the quarries of North Wales are regularly supplied, and consume a good quantity. Only three weeks since, a small cargo of ten tons of dynamite in cartridges was shipped from Hamburg to Carnaryon.

The author has referred to several catastrophes which have been caused by nitro-glycerine, but he can only find that a very few have resulted from dynamite. Since the latter material has been introduced, no accident has occurred either from its manufacture, conveyance, or storage. When the nitro-glycerine factory exploded at Stockholm last year, the dynamite stored close by was found scattered about, but not exploded. Two accidents have happened from the use of dynamite in mines. was caused by the tamping having been incautiously removed after a miss-fire—an operation which ought not to be allowed in any case. The second was due to the folly of lighting the fuse of a charged cartridge and holding it by the hand until it exploded. These are the only accidents the author can discover. Accidents like these, through carelessness, must and will occur in mines, however safe the explosive may be to handle.

It has been urged in some quarters that the addition of silica to nytro-glycerine constitutes a dead loss of explosive power. This, however, is a mistake. Practically speaking, there is no loss whatever. The dangerous properties of nitroglycerine, leakage into crevices, and subsequent untimely explosions under the miner's tools, render it absolutely necessary to make use of cartridges, which leave a considerable air room in the powder chamber of the bore hole. On the other hand, dynamite readily fills up the bore hole, and leaves no empty space. Practically, therefore, a bore hole charged with dynamite will hold fully as much nitro-glycerine as when it is charged with the liquid explosive oil, so that the silica is no drawback to its power, whilst it greatly enhances its safety, and renders it far more convenient for use.

(To be continued.)

### LONDON ASSOCIATION OF FOREMEN ENGINEERS.

T the monthly meeting of members of the A above association, held on Saturday, the 6th inst., the chair was occupied by Mr. Newton, of the Mint, president. Prior to the main business the evening, several new members were elected and proposed. Among the former was James M. Napier, Esq., of Lambeth, who con-tributed at the same time a donation of twenty guineas to the superannuation fund of the institu-

The paper read was entitled "The Epicycloidal Engine: an Effort to Effect Improved Screw Pro-pulsion." It was by Mr. Laird, who had also prepared diagrams and models for its illustration. The author, after demonstrating the necessity of leaving some-



our own inventive and constructive skill, remarked upon the defects of existing marine engines as used in screw propulsion. "The modern shortstroked horizontal screw engine," said Mr. Laird, "owes its shortcomings to the desire to pack the whole machine into the smallest possible compass. That engine, however, is the best which, with a given total length, has the longest connectinggiven total length, has the longest connecting-rod. The disadvantages of the short connecting-rod may be comprehended as thus:—lst. In-creased friction produced by the augmented rubbing pressure of the guide-pieces; 2nd, a certain amount of increased friction on the joint-in between the pieter and connecting and 3rd pin between the piston and connecting-rod; 3rd, increased friction at the crank shaft bearings due to the alternate lift and down pressure upon the shaft; 4th, and most important of all, perhaps, is the irregularity of motion induced by two violent pressures succeeding each other at short intervals, and the long pause intervening when the force is very small.
"In the epicycloidal engine two cylinders of

rather unusual length are placed on either side, and parallel to the screw shaft. To the ends of the piston-rods guide-blocks or slippers are keyed or otherwise secured. Two pins pass through the blocks, and these carry friction rollers with V edges. The rollers work into epicycloidal grooves, cut on the circumference of a barrel, and thus communicate to the latter a rotary motion. barrel communicates motion to the screw shaft and propeller. The object is to create on the face barrel such a curve as would give the action of the crank transmitted to the travel of the piston. In order to obtain this end the circum-ference of the barrel was divided into a given number of parts, say, 12, and half its length into 144, or the square of 12. Then, starting from the middle with 2 on the circumference, and drawing a line to 4 on the half length—from 3 to 9, 4 to 16, 5 to 25, and so on till reaching 12 to 144—a geometrical curve such as that seen on the model exhibited was obtained. The alternate action of the friction rollers into the grooves give the required rotary motion." The author of the paper then entered further into the peculiarities of the construction of the engine but probably its principle will be comprehended from the foregoing observations. In conclusion, Mr. Laird enumerated what he considered to be its practical advantages. They were as follow: Economy of steam, more steady and equable motion, reduced strain on the bearings, and consequently less friction, and, lastly, simplicity of mechanism. The merit of originating the idea of such an invention was due to Captain Ashe, R.N.

During the discussion which followed, Mr. Irvine remarked that he feared the rollers would wear very rapidly, and that he dreaded the evil of back lash. Mr. Stabler defended the crank from the attacks made upon it. Mr. Ives imagined that the friction rollers might be more advan-tageously applied than as shown in the model. Mr. Jansen considered the engine to be a modification of a similar contrivance invented by himself many years since. Other members objected to some one or other of the arrangements.

Mr. Laird having replied, the chairman, in putting the customary vote of thanks, remarked that it would be difficult for the author of the paper to have found a more practical or outspoken audience in the metropolis than he had met that night. He must not be discouraged, however, for it was the habit of foremen engineers to express their views on mechanical points with great freedom. Many inventors had had to run the gauntlet of criticism before their pet schemes had been received and adopted, and, for himself, Mr. Newton said he rather preferred that objections, conscientiously entertained, should be enunciated freely. They had all been instructed by the evening's proceedings, and Mr. Laird would probably think over the various theories, favourable and adverse, advanced during the sitting, and accept or dismiss them as might seem fit.

In closing the proceedings, the chairman expressed a hope that all the ordinary members would be present at the anniversacy festival on the 13th, and that their wives or sweethearts would grace the ladies' gallery with their presence on that occasion.

THE Belgian journals state that, in the neighbourhas beginn journals state that, in the neighbour-hood of Charleroi, a violent epidemic has broken out amongst the cats and dogs. These household pets die after suffering great agony for two or three days. The nature of the visitation has not been accurately ascertained.

# THE TEMPERATURE OF 1868.

AST year will long be remembered for the high temperatures which were registered, which will give an interest to the following statements by Mr. Glaisher, the President of the Meteoro-logical Society:—The mean temperature recorded at the Royal Observatory, Greenwich Park, was 37.2deg. in January, being 1.0deg. higher than the average of the preceding ninety-seven years; the average of the preceding ninety-seven years; in February, 43 Odeg., or 4 Gdeg. higher than the average; in March, 44 O, or 3 Ideg. higher; in April, 48 I, or 2 2 deg. higher; in May, 57 3, or 4 Sdeg. higher; in June, 62 O, or 3 Odeg. higher; in July, 67 5, or 6 Ideg. higher; in August, 63 6 or 2 Odeg. higher; in September, 60 5, or 4 Odeg. higher. The warm weather had prevailed from January 12 to September 30. On October 1 there was a change, and in October the mean there was a change, and in October the mean temperature was only 47.9, being 1.8deg, lower than the average; and in November 41.5, or 0.9deg, lower. On December 2 warmth returned, and the mean temperature of that month was 46.0, being 6.9deg. higher than the average. The mean of these monthly rates gives 51.55 for the mean temperature of the year. The temperature at the Observatory fell to 22-8deg. at the beginning of January, and was 96.6 on July 22, the highest temperature ever recorded at Greenwich. The range of temperature in the year, theretore, was 73.8deg.

# Correspondence.

PRESERVATION OF IRON SHIPS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I have just been shown your impression of January 29, which has an article on the above subject, containing the results of the "most recent and successful attempts in this direction," and find it stated that the "Urgent" troop-ship had been selected to try one of them on. The article relates that "After nearly two years' trial of the composition on that ship, it was found to be as clean as the first day it was put on, although in the meantime the 'Urgent' had been in all parts of the world." I read the above article with great doubt—in fact, with positive unbelief; and in looking through the "Standard" of to-day I find the following, which, as it has such an important bearing on the article in question. I send for your information:—" Urgent, '4, iron screw troop-ship, Captain S. Henderson, at Devonport, has been taken into dock to have her bottom cleaned." The italies are mine, and this statement gives additional proof of the correctness of my remarks and statements in my work on the "Fouling and Corrosion of Iron Ships," that no componity helps. and statements in my work on the "Fouling and Corrosion of Iron Ships," that no compo, paint, glue, plaster, powder, putty, pickle, or other similar contrivance, is of the slightest use whatever, except as a very temporary expedient, for either keeping an iron vessel clean, or the hull free from corrosion, longer than two orthree months at a from corrosion, longer than two orthree months at a trom corrosion, longer than two orthree months at a time, after which it requires to be "hogged," and the vessel docked, with all attendant expense, loss of time, &c., and be repainted, plastered, or smeared, as before, shortly after.—I am, Sir, yours, &c., CHARLES F. T. YOUNG, 7, Duke-street, C.E., M.S.E., Assoc. I.N.A. Adelphi, W.C., February 8.

THE directors of the East London and South The directors of the East London and South London Junction Railway, in their report just issued, state that they confidently expect the first section of the line—from New Cross to Wapping, via the Thames Tunnel—to be ready for opening for traffic in May. Mr. Hawkshaw, the engineer, reports that the works on the south side of the river are in a very forward state, and the contractors have given an assurance in writing that, saving unforeseen difficulties, the line shall be completed to Wapping by that time. The directors home shortly to compute the second The directors hope shortly to commence the second or northern section of the line, from Wapping to the lines running from Fenchurch-street and Bishopsgate stations.

The Manufacture of Watches and Clocks.

A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progross of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends this pamphlet to any address on receipt of two postage stamps, and we cannot too strongly recommend it to the notice of the intending purchaser.—| Advr. |

### TO CORRESPONDENTS

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly payable in advance.

advance.
All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 50 clock on Thursday evening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, ED. M. M.
Advertisements are inserted in the MEGHANICS' MAGAZINE.

faith, ED, M. M.

Advertisements are inserted in the MRCHARIGS MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists
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# Meetings for the Aeck.

MON.—Royal United Service Institution.—Mr. J. M. Hyde, on "Deflecting Armour-Plated Ships for Coast

on "Deflecting Armour-France."

Defence."
Society of Engineers.—Mr. Thomas Buckham on "The Drainage and Water Supply of Farcham," at 7.30 p.m.

Royal Institution.—Mr. Westmacott, on "Fine Art." at 3 p.m.

TUBS.—Royal Institution.—Mr. Westmacott, on "Fine Art," at 3 p.m.

The Institution of Civil Engineers.—Renewed Discussion on "The Mauritius Railways, Midland Line;" and on "The Lagoons and Marshes of Certain Parts of the Shores of the Mediterranean," by Professor Ansted, F.R.S., at 8 p.m.

THURS.—Royal Institution.—Dr. M. Foster on "Involuntary Movements," at 3 p.m.

FRI.—Royal Institution.—"The Female Poisoners of the 16th and 17th Centuries," at 8 p.m.

SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

# Nabal, Military, and Gunnery Items.

It is stated that the effect of the reductions in the Army Medical Staff will be so large that no fresh admissions to the service are likely to take place for a year, if not longer.

A STRIKE of the sailors of all nationalities in New York for higher wages is reported. They now get 16 dollars a month, their wages having lately been reduced, and demand 30 dollars.

We note with satisfaction that the King of Italy has conferred the decoration of the Italian crown, with the grade of Chevalier, upon Mr. Henry Lumley, the inventor of the Lumley rudder.

WE understand that the Commissariat Department of the Army will cease to exist as a separate establishment after the 1st April. Thirty of the present staff of officers are placed on half-pay from this day.

According to the "Bureau Veritas," of Paris, the number of vessels totally lost during the year 1868 was 2.371, of which 2.261 were sailing vessels and 110 steamers. The number of total losses in 1866 was 2,932, and in 1867 3.045. Of the vessels lost in 1868 no less than 1,122 bore the British flag, 253 were American, 210 French, 203 North German, 103 Dutch, 71 Norwegian, and 50 Italian.

WE read that there is no truth in the report that the "Victory" is to be dismantled and removed from her present moorings to the ordinary in Portsmouth harbour. The only change to be made will be that harbour. The only change to be made will be that she will no longer carry the flag of the Commander-in-Chief, or have the flagship's crew and staff on board of her. She will be open to the inspection of visitors as before, and her fittings will be undisturbed.

The new screw steamer, "City of Brooklyn,' built by Messrs. Todd and M'Gregor, of Glasgow. for the Liverpool, New York, and Philadelphia Steam Ship Company, arrived in the Mersey, a few days since, from the Clyde. She is 2,911 tons, customs new measurement, with engines which worked to upwards of 2,300-horse power on the ru round from the Clyde. The run from the Clock to the Cumbraes, with the wind on the port bow, was made in 59 minutes and a half, being at the rate of

building yard, conducted by private enterprise With respect to Deptford yard, which ordinarily employed about 750 hands, it is proposed that model workshops should be established in it—a portion being allotted to the use of manufacturing firms who would become tenants of the Government.

The annual meeting of the Marine Society was held yesterday week, at the offices in Bishopsgate-spreet; the Right Hon. the Earl of Romney, president, in the chair. The report of the Committee for the past year was read and adopted. By this report it appeared that during the twelve months ending 31st December, 1868, 308 poor boys had been received on board the society's training ship "Warspite," at Woolwich, of whom 97 had been sent into the Royal navy, and 187 to the merchant service. The complement of boys on board the "Warspite" had been kept up at 150 (this has since been increased to 160). The committee earnestly invited the attention of all benevolent persons to the good which is being effected by the Marine Society in receiving so many hundreds of destitute boys, and training them for employment a the sea service.

His Excellency the Governor-General of India in Council has much satisfaction in publishing in the "Gazette of India," for general information, the following paragraph of a military letter from the Right Hon. the Secretary of State for India, No. 420, dated the 4th December, 1868:—"Paragraph 1.—I have much pleasure in acquainting your Excellency, that Her Majesty has been graciously pleased to signify her pleasure that a medal be granted to all Her Majesty's British and India forces, naval and military, who took part in the operations in Abyssinia which resulted in the capture of Magdala." The Governments of Fort St. George and Bombay, and his Excellency the Commander-in-Chief in India are requested to adopt early measures for furnishing the rolls of the officers and soldiers or corps who are entitled to the medal now authorized by Her Majesty.

A WROUGHT-IRON pier designed by Mr. C. E. Grover, for the contractors of the work, Messrs. Loutith and Sharrock, of Liverpool, is now in course of construction opposite the Royal Gun Factory Department Royal Arsenal, Woolwich. The pier is to rest upon iron columns, and operations were commenced this day week to screw the first cylinder of No. 1 pier into the bed of the river. The iron used throughout, of which the pier will be constructed, has been tested by the War Department, with the following satisfactory results:—T-iron average breaking strain, 24-50 tons per square inch, and ·158 elongation; angles and bars 21-25 per square inch, and ·158 elongation; plates in girders and wroughtiron cylinders, 24-31 per square inch, and ·158 elongation.

The "Swallow," gunboat, lately made a trial of her engines at the measured mile in Stokes Bay. Her engines are by Messrs. J. Rennie and Son, with Griffith's screw; the draught of water forward is 8ft. 8in., and aft 10ft. 1in.; the load on safety valve, 30lb. Six runs were made at full boiler power, realising a speed of 11·017 knots per hour; and four runs at half boiler power, realising 9·361 knots per hour. Eight circles were made with the following results:

—Both engines ahead, starboard, 3min. 29sec.; port, 3min. 30sec.; one engine ahead and one astern, starboard, 3min. 37sec.; port, 3min. 38sec.; with the vessel at rest, all helm, and one engine only—starboard, 4min. 23sec.; port, 4min. 30sec.; ditto, without the helm, and one engine only—starboard, 6min. 25sec.; port, 6min. 26sec.

The loss of Venetia has not in the least diminished the effective force of the Austrian commercial marine; on the contrary, it is greater now than it was in 1865, when the province still formed part of the empire. In that year its strength was 3,441 vessels of 324,804 tons. At present it does not count more than 3,221, being 220 less, but in the tonnage has advanced to 330,586. The diminution in number has occurred exclusively in the coasters, but in vessels making leng voyages there is an augmentation of 10, and an increased tonnage of 10,173. In comparing the statistics of the sailing vessels in 1868 with those of 1867, there is a difference to the advantage of the former of 569, 19,587 tons, and 762 sailors. The Austrian merchant navy for last year, steamers included, comprised 7,963 of 343,030 tons, and 15,611 horse power, manned by 27,387 seamen.

# Miscellanen.

In four adjoining tenements at St. Buryan, in the Land's-end district, there are living nine persons, whose average ages somewhat exceed 74 years.

THE "Gazette des Hopitaux" announces that subnitrate of bismuth has been employed in large doses with wonderful success in Algeria as a specific for dysentery.

A FEW days since the electric fluid fell on the church of the commune of Fougerets, Bretagne, when the steeple and a portion of the building became the prey of the flames.

THE sixteenth anniversary dinner of the London Association of Foremen Engineers is appointed to take place to-morrow, the 13th instant, at the City Terminus Hotel" (Cannon street Station.)

RECENTLY Mr. Gristwood, of Clewer Court Farm, near Windsor, caught in a net, at one haul in the Thames, 400lb. of pike, perch, and other fish. Mr. Gristwood has a right to use a net to the extent of his boundary.

THE three oxen for the promenade of the boungras at Paris were this year purchased by dealers unconnected with the butchery trade, who paid £760 for them, an enormous sum, amounting to 3s. 4d. for the pound of meat.

WE are informed that the College of Physicians has ordered the printing of a number of copies of the "New Nomenclature of Disease." The work will be on sale at the college in Pall-mall in about a week or so.

THE amounts at the credit of savings banks with the National Debt Commissioners on January 23, were as follows:—Trustee savings banks, £36,867,634; Post Office savings banks, £11,811,042, making a total of £48,678,676.

The number of visitors to the Patent Office Museum, South Kensington, for the week ending February 6, 5,094. Total number since the opening of the Museum, free daily (May 12, 1858), 1,497,751.

Through the upsetting of an engine on the railway, the telegraph wires of the Mediterranean line were recently broken. Communication was cut off for three or four days, as they never repair anything in a hurry in Spain.

THE tower of the parish church of St. Issey, Cornwall, which contained a fine peal of bells, fell with a tremendous crash on Tuesday week. The roof of the church was broken entirely in, and the organ was smashed to pieces. The heavy gales have gradually brought about this destruction.

THE number of Cornish pumping-engines reported for December is 20. They have consumed 2,158 tons of coal, and lifted 16-7 million tons of water 10 fathoms high. The average duty of the whole is, therefore, 52,300,000lb., lifted 1ft. high, by the consumption of 112lb. of coal.

EARLY on Sunday morning, Florence was visited with two shocks of earthquake. They were, fortunately, slight, and did no damage beyond causing a good deal of alarm to the inhabitants by the shaking of the furniture and the moveables in the houses.

At Trebarwith Downs, in the parish of Tintagel, Cornwall, a slate quarry has been recently opened, under the superintendence of Captain Jenkins. Recently, a workman split a large piece of rock, in which he found embedded the fossil of a reptile about 20in. long. This stone was raised 22ft. from the surface, or 17ft. in solid rock.

The time gun at Newcastle, very much to the surprise of the town, went off at five minutes to twelve on Saturday morning. The attendant had loaded the gun an hour before his usual time—namely, at half-past eleven, instead of half-past twelve, and the electric telegraph officials had happened shortly afterwards to test the wire; hence the unusual report. The gun was fired again, as usual, at one o'clock.

THE number of visitors to the South Kensington Museum during the week ending February 6, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 14,828; Meyrick and other galleries, 3,024; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 1,810; Meyrick and other galleries, 210; total—19,872. Average of corresponding week in former years, 9,768. Total from opening of Museum—8,136,767.

The following is a return of the quantity of coal exported from Grimsby during the month of January:—To Belgium, 676 tons; Denmark, 636; Egypt, 6,158; France, 5,785; Hanseatic Towns, 1,112; Holland, 346; Italy, 2,254; Norway, 167; Spain, 1,730; Spanish West Indian Islands, 777. Foreign, 19,641 tons; corresponding period, 1868, 19,640 tons. Coastwise, 2,506 tons; corresponding period, 1868, 4,821 tons. Total, 22,147 tons; corresponding period in 1868, 24,461 tons. Decrease, 1869, 2,314 tons.

A TERRIBLE storm broke over Bragneres de Luchon, France, a few days ago. Its fury was such that many of the farmhouses and barns in the valleys of the Lys and the Hospice are demolished or damaged. In the village of Saint Mamot all the thatched roofs and many slated ones were blown off. Several enormous elms and poplars have been uprooted. Towards ten at night a column of flame indicated that the forest of Cazarith was on fire, and the strength of the wind caused the conflagration to spread rapidly.

THE emigration returns for the Clyde ports during the past month show a very large decrease over those of the corresponding month in 1868. In January, 1868, 618 emigrants left the Clyde; but in £180.

January, 1869, only 352. In the month of January, in 1867, 1866, and 1865, the numbers were respectively 240, 402, and 233. Of the emigrants who embarked last month all went to America save one, who sailed for Palermo. New York alone absorbed 336, Portland 10, and Demerara 5. Of the passenger arrivals during the month there were 210, all from New York.

HEATING churches by hot water would appear to be not entirely unattended by danger. The church of Restalrig, N.B., a quaint old-fashioned looking building—a restoration of an edifice which dates from the time of James III.—has for some time past been heated by steam. The furnace is under the charge of an old woman and a boy, and it was lighted as usual on Sunday week. It is supposed that, from inattention or want of knowledge, it had been allowed to get overheated; and about twelve o'clock the pipes burst, with a report described as being equal to the noise of a battery of field pieces. One gentleman had his arm severely scalded. The damage done to the church is very considerable.

The Royal Horticultural Society held their annual general meeting in the council-room at South Kensington on Tuesday last, Mr. J. Bateman, F.R.S., in the chair, when three new members of council were elected—viz., his Serene Highness the Prince Teck, Lord Londesborough, and the Rev. Joshua Dix. The report was then read by Mr. Richards, the assistant secretary. Mr. Dale proposed, and Mr. Plumbe seconded, the adoption of the same, which was carried. Mr. Edgar Bowring, C.B., M.P., proposed a vote of thanks to the chairman, not only for his conduct in the chair on that occasion, but also for the many interesting lectures he had been good enough to favour the society with during the past year; and to the council generally for their excellent management of the affairs of the society.

THE great ploughing match, which is perhaps the most important this season, has just come off at Rudchester, near Newcastle-on-Tyne, and was one of the most successful the Northumberland Society has ever held. The greatest excitement prevailed, competitors attending from long distances, and ne less than 60 teams entered the lists. All the prizes in the Men's Swing Plough Class were carried off by local ploughmen, with Howard's ploughs. Messra. Howard had presented a wheel plough to be competed for in the wheel class, and this was won by a local ploughman with a Hornsby's plough, completely distancing Messrs. Ransomes, whose ploughs, it is stated, were beaten in every class by Howard's or Hornsby's, very different results to those obtained by Ransomes ploughs in Durham.

The Brazil Mint, at Rio Janeiro, is under the direction of the Minister of France. The governor is called the provedor. The steam machinery and pipes for casting and coining, &c., are of the most perfect kind. In the assay of gold, 200 milligrammes are now employed. The refining is carried on in plantinum vessels. From July, 1840, to July, 1864, says the "Society of Arts Journal," there were struck 38,808,890 gold coins, and 13,765,553,500 silver, besides many medals of various kinds. There is in the mint a collection of the various coins struck in the former monetary establishments of the country, and 572 coins of other countries. It has also 83 dies of Brazilian medals, and 1,027 foreign medals. There is attached to the mint a school for painting, plaster-sculpture, and engraving, and each workshop has its own library.

The excavations of the Temple of Bacchus at Athens are just now attracting the attention of antiquaries. M. Piot, a French gentleman, writes from that city that he has just discovered the remains (trunk and head) of a colossal faun. What renders this discovery the more interesting is that M. de Longperier, after esmparison of the measures given by M. Piot, has found that the proportions and forms of the faun are just those of the four caryatides in the Louvre. These last were known to come from the Villa Albani, but the place of their first origin had not been ascertained; the fifth is at the nuseum at Stockholm. There is now every reason to suppose that it is the sixth of these statues which has now been discovered, and that it formed, with others, the monumental decoration of the Athenian Theatre consecrated to Bacchus.

The organization of efficiently constituted fire brigades has been a matter of serious consideration amongst many of the authorities in our country towns. Amongst those towns may be selected Market Rasen and Wragby, in Lincolnshire, and Wootton Basset, near Swindon. These towns, each averaging a population varying from 3,000 to 5,000 inhabitants, have selected, through their committees appointed for the purpose, the well-known "Paxton" fire engines introduced by Messrs. Merryweather and Sons, in the year of the Great Exhibition, 1851. This description of engine was designed by the above firm to meet the requirements of the country towns, both as regards simplicity, easy management, and cost. It is stated that the fire brigades in each of the towns are fully equipped with fire-engine and every requisite for sums varying from £105 to



# Watents for Inbentions.

# ABRIDGED SPECIFICATIONS OF PATENTS

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. I should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are bereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—2336, 2346
BUILDINGS AND BUILDING MATERIALS—2299, 2307, 2324,

2345
CREMISTRY AND PHOTOGRAPHY—None
CULTIVATION OF THE SOIL, including agricultural implements and machines—2311, 2341
ELECTRICAL APPARATUS—None
FIBROUS FABRICS, including machinery for treating fibre pulp, paper, &c. —2302, 2304, 2312, 2315, 2327, 2331, 2338, 2339, 2344

1339, 2344
FOOD AND BEVERAGES, including the apparatus for pre-paring food for men and animals—2329
FURNITURE AND APPARKL, including household utensils, time-keepers, jewellery, musical instruments, &c.—

time-keepers, jewellery, musical instruments, &c.—
None.

GENERAL MACHINERY—2300, 2301, 2303, 2318, 2328, 2330
LIGHTING, HEATING, AND VENTILATING—2325
METALS, including apparatus for their manufacture—
2310, 2316, 2334, 2340, 2342
MISCELLANEOUS—2304, 2309, 2313, 2314, 2317, 2321, 2322,
2335, 2337
BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2342
SHIPS AND BOATS, including their fittings—2326
STEAM ENGINES—2320
WARFARE—2305, 2308, 2319

2298 An extension of time for filing the specification of this patent has been granted by order of the Lord Chancellor, on account of opposition having been entered against it.

cellor, on account of opposition having been entered against it.

2299 W. T. Hamilton, Dublin. Dove-lailing machine.
Dated July 22, 1868.

The principle of this machine is this. A disc carrying a circular saw is mounted upon an axie capable of reciprocating as it rotates in its bearings. The movement of this disc is so governed, that the saw shall be always in a vertical plane, and, by its sweep, cut away the material offered to it in a triangular form. The mounting of the disc is upon the principle of a universal joint, the inner member of which is free to turn upon a pin passing through the axie, whilst the disc or outer member is free to turn upon a like pin passing through the inner member. These pins are at right angles to each other, but in the same plane. The disc, and with it the saw, is thus free to move in every direction, but a rim or strap working on the circumference or side of the disc maintains them always in a vertical plane, either by turning upon two pivots provided in the frame, one above and the other below the saw, or by working in a horizontal slot at the back of the saw. When the material is passed up the front of the saw vertically, a tail will be cut, When the material is advanced endwise or horizontally upon the saw, the interval between two pins will be cut, the circuiar effect of the saw being rectified by a small vertical movement of the feeding table.—Patent completed.

2300 C. F. Waldo, Cheapside. Raising water. (A communication). Dated July 22, 1868.

table.—Patent completed.

2300 C. F. WALDO, Cheapside. Raising water. (A communication). Dated July 22, 1868.

This consists in obtaining vacuum by the sudden condensation of steam. By this invention, by means of the sudden condensation of steam, an instantaneous vacuum of far greater comparative proportions is obtained than usual, into which the water or fluid, almost as instantaneously, is drawn, and is then expelled therefrom, simply by the force of steam pressure, directly applied, so that by the alternate application of the suction power of a vacuum caused by the condensation of steam in a vacuum chamber, whereby such chamber is caused to be filled with water or fluid, and the direct application of the power of steam pressure to the water or fluid to expel it therefrom, the water or fluid is transferred from one elevation or place to another.—Patent abandoned.

2301 W. T. HAMLITON. Dublin. Converting motions.

another.—Patent abandoned.

2301 W. T. HAMILTON, Dublin. Converting motions.
Dated July 22, 1868.

An axle is so mounted as to be free to revolve and reciprocate in its bearings. A circular disc is mounted on this axle as to be inclined to its at my desired angle. The disc revolves in a rim or ring in the nature of an eccentric strap. This strap carries a pin, which works in a hole in a vertical stud, and is so mounted in the frame of the machine as to be free to revolve through a small arc. The pin has thus a freedom for radial as well as for twisting motion. To obtain reciprocation without rotation, the axle is made merely to revolve, whilst the object in which the vertical stud is mounted is left free to move in guides. Or the vertical stud may remain fixed, and the axle free, whilst a second pin is introduced at the opposite side of the strap working in a second vertical stud. The object in which this last is mounted will then reciprocate.—Patent completed. completed.

2302 L. DULAC, Le Nord, France. Drying threads. Dated

2302 L. DULAC, Le Nord, France. Drying threads. Dated July 22, 1868.

This relates to improved machinery or apparatus for effecting the simultaneous drying and beating of flax, hemp, cotton, wool, and other threads or hanks. The machine is composed of a central horizontal shaft, carrying circular plates or discs, from which radiate a number of arms. Each disc carries an equal number of arms, on which latter are placed other bars in a parallel position to the shaft. These bars form a series of pallets, corresponding in number to the arms around the central shaft, leaving an open space between them and the shaft. The shaft is

mounted at each end in a framing, forming air chambers in communication with the centre of the machine. There are four modes ordinarily employed in drying threads:—First, by centrifugal force; second, by a vacuum or rarefaction of the air; third, by a current of air; fourth, by theat. The whole of these are combined in the machinery of this invention. Thus the centrifugal force produced by the rotation of the machine will discharge the moisture from the centre towards the circumference. The air also being by the centrifugal force driven towards the circumference, will further serve to produce the rarefaction suited for extracting the moisture. This rarefaction may be increased or diminished by means of doors, the opening of which is regulated according to the amount of air to be admitted into the chambers.—Patent completed. mounted at each end in a framing, forming air chambers in communication with the centre of the machine. There

which is regulated according to the amount of air to be admitted into the chambers.—Patent completed.

2303 S. H. Hadler, Hampstead. Decorticating grain. Dated July 22, 1868.

The patentee proposes to employ a box, into which the wheat or grain is fed, and in which it is subjected to a rubbing action; this box is open at the top and closed at the bottom. Inside the case, and extending down to the bottom thereof, is a revolving agitator or rubber, which may be of a conical or other form; the wheat or other grain to be decorticated is fed freely and continuously into the top of the box, so that the box is kept full of grain, and the grain passing down between the sides of the agitator or rubber and the case is thereby subjected to a rubbing action, and is allowed to escape through holes in the side of the box and near its bottom, or through openings in the bottom itself. The size of these openings may be regulated by slides, so as to regulate the speed at which the grain passes through the machine, and consequently the amount of friction to which the grain is subjected, the space between the bottom of the central agitator or rubber and the side of the box is, by preference, made less than the space between the top of the agitator or rubber and the box; the surfaces, both of the central rubber and the box, are also, by preference, corrugated; the central rubber as caused to revolve rapidly, and the outer box might be made to revolve slowly in the same direction.— Patent completed.

2304 T. A. WARD and H. WHALE, Newington-causeway. Racket bats. Dated July 22, 1868.

The hoop of the racket bat is made of cane, instead of sah, as now used, with a plece of hard wood glued down the centre of the handle to give it solidity; the bat is strung with gut in the usual way.—Patent abandoned.

2305 C. E. BROOMAN, Fleet-street. Firearms. (A communication). Dated July 22, 1888.
This invention relates to breech-loading firearms of that class in which the breech end of the berrel is closed

2305 C. E. BROOMAN, Fleet-street. Firearms. (A communication). Dated July 22, 1868.

This invention relates to breech-loading firearms of that class in which the breech end of the barrel is closed by a block, whose rear end works on a horizontal pin having its axis at right angles to the axis of the bore of the barrel, and consists in a peculiar combination of mechanism, whereby the arm is made stronger, more easy to operate, simpler in construction, and more economical to manufacture, than other firearms of its class.—Patent completed.

2306 T. F., J. F., C. H., and E. FRITH, York. Looms. Dated July 22, 1868.

These improvements have especial reference to hand looms and power looms used in the weaving of carpets, or to woollen, worsted, or other fabrics, and consist of a simplified arrangement of parts whereby pieces are woven in which considerable variation of the "shed" is required to obtain the requisite pattern or design. For this purpose, two treadles or levers are employed, each of which communicates, by means of an overhead lever, with an arrangement of mechanism as follows:—Above the loom and over the healds a small framework is mounted, provided with a horizontal "cart cylinder" on either side. Between each cylinder and the framework hang a series of vertical metal plates or strips, it yields inwards or towards the framework, and so presses a horizontal pin (having an oblong late in its centre part) through which any one of the metal plates or strips, it yields inwards or towards the framework, and so presses a horizontal pin (having an oblong lot in its centre part) through which passes a vertical flattened needle or "tabbie," the lower end of which is connected by a cord passing over a pulley swinging from the top of the framework to an adjoining needle or tabbie and consequent heald. On either side of the two rows of needles connected as before-named to their relative healds, passes a horizontal lever, having its fulcrum in the front part or side of the loom, and connected with the treadle lever ar

-Patent completed.

2307 H. Fear, Birmingham. Door springs. Dated
July 22, 1868.

At the lower part of the axis on which the door turns is
a double incline, and a roller carried by a vertical slide
bears upon the said double incline. On the top of the slide
a series of flat springs press, the tension of which may be
increased or diminished by means of a screw acting upon
them near their fixed ends. When the door is opened, in
one or other direction, one or other of the inclines

described raises the roller and slide, thereby bringing the flat springs into action, and when the door is at liberty to move, the pressure of the roller on the incline brings the door to its closed position.—Patent abandoned.

door to its closed position.—Patent abandoned.

2308 F. H. Hambleton, Piccadilly. Armour plates.
Dated July 22, 1868.
Several plates or bars of which a forging is to be composed are heated by suspending them vertically in a furnace, the plates being suspended at such a distance apart from one another as to allow the heat to have free and uniform access to the entire surface to be welded. Subsequently, the several plates or bars are welded by drawing them up vertically through rolls. By thus keeping the plates or bars in a vertical position whilst they are passing through the rolls, perfect facilities are afforded for the escape of all impurities from the surfaces of the several plates of metal as they together come up to the rolls. The rolls may be placed over the mouth of the furnace, so that the plates may be drawn up vertically from the furnace through the rolls. Or if plates be placed on edge horizontally in the furnace, a suitable distance apart, the plates might be drawn horizontally from the furnace, then turned on end, and afterwards welded together by being drawn up vertically through rolls.—Patent completed.

2309 W. DENNIS, Aldermanbury. Letter boxes. Dated

drawn up vertically through rolls.—Patent completed.

2309 W. Dennis, Aldermanbury. Letter boxes. Dated July 22, 1868.

This consists in constructing the box with or without a fan wheel at the aperture, and dividing the box, at about the centre thereof, with two pieces of metal of a triangular form, somewhat similar to the letter V, and either with or without a flap joint near the point thereof. The flap joint may be shut by a hinge, and made to balance and close of itself after a letter in its descent has pushed it open, and passed through into the bottom of the box. In constructing letter pillars according to this invention, a bag is employed having iron rims similar to a travelling bag, and fitted with one or more spring locks. The pillar is fitted with two doors; upon opening the first or outer door, a handle must be pulled before the inner door can be opened. This handle is fixed upon a metal rod formed with a projection at the end, which pulls the two rims of the bag together, so as to lock the bag. This movement serves also to release the lock of the inner door, so that it can be opened and the bag with letters taken out and locked. A key is to be kept at the chief office for opening the bag.—Patent abandoned.

2310 J. Bowron and G. Lunge, South Shields. Iron

the bag.—Patent abandoned.

2310 J. Rowron and G. Lunge, South Shields. Iron and steel. Dated July 23, 1868.

This consists in mixing fluoride of calcium, the same being obtained artificially or in the form of native fluor spar, or the mineral known as "cryolite," either in a state of fine division or otherwise, with the materials used in blast furnaces, for the purpose of removing, either whollly or in part, the phosphorus contained in the pig iron to be obtained therefrom. The fluoride of calcium should be used in the proportion of from two to twenty times that of the phosphorus contained in the materials under treatment, according to the quantity of the latter, and the degree of purity which it is desired to produce. It further consists in using fluoride of calcium or cryolite in puddling and other furnaces as a "fetting," to aid in the manufacture of wrought iron and steel, by the removal of the phosphorus contained therein.—Patent completed.

2311 A. BRECHAN, Aberdeen. Ploughs. Dated July 23,

2311 A. BEECHAN, Aberdeen. Ploughs. Dated July 23, 1868.

The frame of the plough is similar in shape to those ordinarily in use, but is constructed in a lighter manner, and the mould board is also of the usual form. The sole of the plough is reduced very much in length, say, to fin, or thoreabouts. Immediately behind the sole is a wheel mounted in suitable bearings, attached to the frame, so as to run vertically. Behind this wheel is a smaller wheel also mounted in suitable bearings attached to the frame, but so as to revolve horizontally. The larger vertical wheel carries the weight of the plough and removes the friction of the sole on the ground, whilst the horizontal wheel takes the place of the side plate in the ordinary plough, and by its horizontal revolution on the groundut by the plough, the lateral friction is materially reduced.—Patent abandoned.

2312 E. T. Hughes, Chancery-lane. Treating flax. (A

cut by the plough, the lateral friction is materially reduced.—Patent abandoned.

2312 E. T. Hughes, Chancery-lane. Treating fax. (A communication). Dated July 23, 1868.

The object of this invention is to remove the glutinous matters enveloping the primary or cell fibres of flax, so that they can be more readily separated from each other by picking, carding, or other suitable machinery. A skeleton cylinder is placed within a tank which holds the chemical solutions. The cylinder contains the flax and is slowly rotated, the lower half of the cylinder being immersed in the different solutions, while the upper half is above and out of the same. This secures a thorough circulation of the solution, as gravity drains off the solutions from the upper half of the cylinder constantly immerses the lower half of the same. A longitudinal open space is made in the centre of the cylinder immediately around the shaft of lift, or lish, in diameter, as an escape for the solutions for the upper half of the cylinder. This space will also answer the purpose of introducing an air blast through the flax to dry it and to aid in the disintegration of the fibre at the close of the process. This open space is surrounded with longitudinal slat work to keep the flax in the body of the cylinder from filling it. The heads or ends of the cylinder except this open space, are closed. The cylinder except this open space, are closed. The cylinder emorable pieces are fitted on each section for filling and emptying the sections.—Patent completed.

2312 W. Gilbert, Birmingham. Lockets. Dated July 23

2313 W. GILBERT, Birmingham. Lockets. Dated July 23

1868.

The frame for carrying the miniature turns out of the case of the locket at the side of the case, instead of making the locket open by a lid similar to the lid of a box or cover of a book. The case is made of one piece of metal folded at its middle, the blank having the figure of the two sides of the case joined together by a narrow strip or band. The doubling of the blank is effected at the narrow strip or band. The frame of the locket may be composed of a blank having the figure of the two sides of the frame joined by a band or strip at the middle. When doubled at the band, the frame is fixed in the case by means of the suspending ring, which passes through a hole in the case and frame opposite, or nearly opposite, the bands where they are folded. The frame of the locket turns upon the suspending ring as a centre. The folded band of the case constitutes a stop against which the folded band of the



frame shuts or abuts, and by which the motion of the said frame is limited. The folded part of the frame also constitutes a catch, by means of which the frame may be drawn out of its case by the application of the thumb or fluger nail.—Patent completed.

2314 P. PEARSON, Leeds, Cocoa. Dated July 28, 1868,

1814 P. PEARSON, Leeds, Cocoa. Dated July 28, 1869,

1815 Cocoa nuts or nibs, obtained by decoction, infusion, or other known means, and adds thereto about one quarter of a pound (more or less, as desired), of cocoa from which the fatty matter has been wholly or in part previously expressed or extracted, and then adds (if desired) any suitable flavouring matter (such as vanilla, for instance), and also a sufficient quantity of alcohol or other preservative agent. By these means a concentrated essence or preparation of cocoa is produced in a liquid or semi-liquid form, and which is always ready for instant use.—Patent completed.

and which is always ready for instant use.—Patent completed.

2315 T. Hart, Blackburn. Cord and twine. Dated July 23, 1863.

This invention consists in the employment of a carriage and tramway. On the carriage, and parallel to the tramway, are a number of spindles carrying bobbins on which is the material or strands. At right angles to the tramway, or extending in front of the carriage, is a bar or rod having a number of holes or eyes therein, through which the strands are passed and attached to the "twisting frame." At intervals along the line of tramway are received a number of "stakes" or beaters having arms thereon extending across the tramway below or clear of the rod above mentioned, so that as the carriage passes along the tramway, the strands are deposited in notches of the bearing arms. The carriage having arrived at the end of the tramway, the eye rod is, by means of a rack and pinion on the end of the rod, caused to revolve, so that the strands are wrapped around such rod, and the carriage can thus be drawn towards the twisting frame and the twine put in. Attached to and working on the stakes or bearers, is an arm having angular indentations therein; this arm extends under the strands, and by means of a lever and wire, or cord, cau be raised by the attendant at the twisting frame, so that two or more strands may be raised out of the notches of the first arm to the angular indentations in the second arm, and doubled.—Patent abandoned. abandoned.

2316 F. HORNER, Manchester. Coating metals. Dated July 23, 1868.

July 23, 1868.

The improvements consist in the application of copper to the exterior surface of an inferior or base metal. For example, a chandelier now made of brass may be made of cast iron, and a coating of copper may be applied thereto by means of electrotyping apparatus.—Patent abandoned.

to the exterior surface of an interior or base metal. For example, a chandelier now made of brass may be made of cast fron, and a coating of copper may be applied thereto by means of electrotyping apparatus.—Patent abandoned.

2317 W. S. Harrison, Peckham. Timekeepers. Dated July 23, 1868.

The object of this invention is to enable a motor or regulator clock which keeps true or normal time to correct or regulate any convenient number of other clocks or timekeepers at a distance therefrom by means of a current of electricity which is caused to pass during the last few seconds of each hour (or at any convenient time) from the "motor" or regulator to the other clocks, detaching the motion work of the hands from the "going" mechanism, and unlocking the fly of a special movement which sets the hour, minute, and second hands backwards or forwards to the exact time required, holding them in that position until the moment that the motor or regulator roldicates the precise completion of the time, when the latter breaks electrical contact, unlocking all the hands of the other clocks simultaneously, and throwing them instantly into gear with the "going" mechanism, so that the starting of all the clocks at the time required shall be synchronous, and in perfect accordance with the time indicated by the motor or regulator clock. The arrangement of mechanism employed for effecting this object is as follows:

—The motor or regulator clock is provided with a pin or cam on the minute wheel, which, during the last five seconds in each hour, presses on a spring lever, and thus makes and maintains electrical contact with a battery connected therewith, and with a special "line wire" connected with all the clocks to be regulated, and thereby excites a magnet connected with each clock to be required. The movement of the armature raises a lever and releases a "fly," allowing the special setting mechanism to come into operation; this mechanism or train first disconnects the dial wheels and hands from the driving mechanism of the clock b

ously with the motor clock.—Patent completed.

2318 M. T. SHAW and T. H. TURNER, Cannon-street,
Hydraulic lift. Dated July 23, 1868.

This invention has for its object improvements in
hydraulic apparatus for lifting, hauling, and lowering, and
the improvements relate, first, to obtaining variations of
power from the hydraulic cylinder or cylinders of the lifting, hauling, or lowering apparatus. For two powers an
ordinary cylinder and ram is employed, the area of the
ram being as much less than the area of the cylinder as
the difference between the high and low power. This
ram is made sufficiently short so that another piston is
omployed that flis the cylinder water-tight, by packing or
other means, and which would, when the ram was at the
in part of the stroke, be at the bottom of the cylinder,
between the end of the ram and bottom cylinder cover.

There are two admission pipes at the top and bottom end of the cylinder, so that the water is admitted under the small ram, leaving the piston at the bottom of the cylinder, and exhausting only the central contents of the ram in the return stroke by the pipe at the top end and valve arrangement. When the high power is required, the patentees put the water under the loose piston, which then carries up the ram with it by simply pushing it—thus a second power is produced. In constructing turning gear for hydraulic cranes, a midfal piston of the requisite size is fastened on the main pillar of the crane, and revolving with it; this piston or plate is enclosed in an annular cylinder concentric with the main spindle, and, by means of a fixed partition standing out from the cylinder, passing across the annular space between the cylinder and the spindle, and also by valves or openings on either side of this partition.—Patent completed.

2419 J. PURDBY, Oxford-street. \*Pirearms.\* Dated July

2419 J. PURDEY, Oxford-street. Firearms. Dated July

23. 1882.
This invention relates to the obtaining for firearms a movable and adjustable elevator for the breech, to suit the varying requirements of the user. Over the tang of the breech-piece a removable plate is filted, corresponding in shape somewhat with the shape of the tang of the breech-piece of the firearm. This plate is secured in place on the tang by hooking its rear end into a slot cut in the tang of the breech-piece, but it may be secured in any other convenient manner that will allow of its being readily unshipped and removed. The height or vertical position or elevation of the forward end of the movable plate is regulated and adjusted by means of an adjusting screw, which enters a hole tapped in the tang.—Patent completed.

2320 C. E. BROOMAN, Fleet-street, City. Rolary angines.

which enters a noise tapped in the thing.—ratent completed.

2320 C. E. Brioman, Fleet-street, City. Rolary engines.
(A communication.) Dated July 23, 1868.

This consists in a new arrangement of rotary steam engines, in which the steam acts by reaction on hollow radii disposed in a special manner, which reaction produces a rotary motion in the contrary sense to the escape of the steam. The machine is composed as follows:—A movable cylinder or disc is mounted ou a hollow axle. This cylinder or disc has a number of apertures leading to its periphery, and is free to turn in a fixed circular casing which has a number of projections or stops on its inner periphery to divide it into a number of compartments, The axle is furnished with two distributing apertures, formed near one of the bearings, in which the axle turns, through which apertures the steam enters the interior of the axle intermittently. The bearing is kept pressed against the axle by means of tightening screws, so as to prevent all escape of steam. At each turn of the axle it makes two distributions of steam.—Patent abandoned,

2321 J. Kilner, Wakefield. Glass. Dated July 23, 1868.

makes two distributions of steam.—Patent abandoned, 2321 J. KILNER, Wakefield, Glass. Dated July 23, 1868. The patentee claims the use and application of a reverberatory furnace for the manufacture of glass, by placing the materials requisite to form glass directly on the bed or floor of the furnace without any pots, as usually adopted. The furnace having an arched and inclined roof, the flame and heat, in passing to the main chimney, are deflected upon the surface of the materials, and such materials are quickly fused and kept in a fluid state, as required.—Patent abandoned. Patent abandoned.

quickly fused and kept in a fluid state, as required—Patent abandoned.

2322 J. S. BROOMHEAD and J. WHITMER, Clerkenwell.

Gas regulators. Dated July 23, 1869.

This consists of a cast-from case and cover, with flexible diaphragm, brass ring, and cap. The ring is for the purpose of fixing the diaphragm with screws in its place. A cast-from cover is fitted in its proper position, and screwed on to the flange of the case, the screw passing through the flange of the cover, diaphragm and brass ring, thus affording additional security to and preventing any injury of the diaphragm.—Patent completed.

2323 A. BOCHKOLTZ, Vienna. Pump valces. Dated July 24, 1868.

The object of this is to prevent a waste of motive power, and consists in the employment of self-acting valves actuated by compressed air; the cylinder with the valves is attached to the ordinary cylinder of the engine. It is accomplished by fitting to the interior of a pump cylinder two pistons on one rod, which works through the end covers of the same. The cylinder has two chambers in connection with it; these chambers are furnished with outlets and safety valves. On the up stroke of the piston the air above is compressed, and fresh air is sucked in below, which, on the down stroke, is compressed in a similar manner. This compression of the air at each stroke acts as a cushion, and serves to steady the motion of the main piston at the end of each stroke.—Patent completed.

2324 B. G. HATFIELD, New York. Door rollers. Dated

2324 B. G. HATFIELD, New York. Door rollers. Dated

2324 R. G. HATFIELD, New York. Door rollers. Dated July 24, 1868.

This consists in fitting the axis of a sliding door roller to run in a slot in the casing in which the roller is mounted. The roller casing, which is recessed into the door in the usual manner, is provided on each side with a slot, in which work the ends of the roller axie, the length of the slot being determined by the distance the door has to travel and the relation between the circumference of the wheel and the axies. By this means the axie is caused to roll upon a horizontal plane, thus greatly diminishing the friction, and obviating the necessity of lubricating the working parts. In this manner, a permanently easy motion is ensured with a minimum of friction, the axie and its bearings not being worn away, as heretofore.—Patent completed.

2325 F. H. DANCHELL, Bolton. Utilizing fuel. Dated

or material is placed or driven, which softer metal is not capable of injury by the galvanic action of the bottom plating, or of the sheathing, or only so to a small extent, and is either the bed to receive the fastening or is itself the fastening or the sheathing.—Patent abandoned.

the fastening or the sheathing.—Patent abandoned.
2327 W. R. LAKE, Chancery-lane. Separating cotton
Dated July 24, 1858.

This consists chiefly in making the spike teeth of a
picker machine so that the whole of that portion of each
tooth which is to project radially from the carrying
cylinder shall be thin or flat in its transverse section, and
when the teeth are inserted in the bugs of the cylinder
with their fluttened portions projecting radially therefrom,
the flat surfaces shall be in vertical planes parallel with
each other, and with the planes of the ends of the cylinder.
Thus the thin form of the ends of the teeth will be presented to the rolls of the machine during the continued
wearing away of the teeth, the rolls or the cylinder being
made adjustable in the bearings so as to be readily aftered
in position to compensate for the gradual shortening of in position to compensate for the gradual shortening of the teeth.—Patent completed.

made adjustable in the bearings so as to be readily altered in position to compress for the gradual shoriening of the teeth.—Patent completed.

2328 G. Smith, Camberwell. Forcing fluids. Dated July 24. Isos.

This consists chiefly in the posuliar mode of arranging the blades or plates of rotary engines, so that they may work freely, and yet remain steam-tight during their recolutions around their axis, in the method of hieging or jointing the blades together at the axis, and in the peculiar construction of the outer extremities of the blades, or of pieces attached to the same, to form a steam-tight bearing surface upon the surface of the cylinder. The improvements also consist, partly, in the peculiar construction of the shaft of the eccentric drum and method of attachment of the drum to the shaft, to admit the blades, and to allow the drum to adjust itself laterally on the shaft; also in the employment of loose discs or plates, which are fitted against the ends of the drum and cylinder, between the covers, for the purpose of preventing the escape of steam at those points. The invention also consists in the peculiar arrangement of ports and valves, for the ad dission, exhaustion, and expansion of the steam, and in the means employed to equalize the wearing of the bearing surfaces of the blades, and to diminish friction, where these ports or apertures are formed through the working surface of the cylinder. The invention also consists partly in the peculiarity of arrangement and combinations of the various parts, whereby they are rendered self-adjusting by the pressure of the steam. The rotating blades are hinged together at the centre of the cylinder, upon a pin or rod passing through jaws formed on each blade. The haddes are fitted to slide through packing pieces, extending lengthwise across the drum; these packing pieces are fitted tourn in circular bearings, near the periphery of the drum, and thereby allow the blades to adjust themselves as they rotate, and keep their outer surfaces properly in contact with

nearly in contact with the periphery of the cylinder at one point.—Patent completed.

2329 G. A. Shibirage, Versailles. Practing food. Dated July 24, 1868.

This consists in the preparation of a preserving solution or liquid, and in submitting the animal and vegetable substances to be preserved to the processes hereafter described. The preserving solution is prepared in the following manner:—In 1,000 parts of filtered water, more or less, is carefully mixed 100 parts of non-arcenical sulphuric acid of 66deg. When the solution has been prepared in the manner described, the animal or vegetable organic matter to be preserved is immersed therein. It is allowed to remain on the liquid for about they minutes, at a temperature of about 60 leg. to 80deg, Fah., when it is removed. If the temperature is lower than 60deg, the time of immersion must be lengthened the same proportion as the temperature is lower. The animal or vegetable substance is then submitted to a methodical washing in filtered water, and, if possible, the water is purified with charcoal: the washing is accomplished more rapidly when a current of water is used. Care should be taken in the washing, as in the other operations, to preven tearing the surfaces of the substances which have been submitted to the action of the preserving liquid. The washing is stopped when the surfaces of the animal or vegetable matter are no longer impregnated with the preserving substance.—Patent completed. pregnated with the preserving substance.—Patent com-

door in the usual manner, is provided on each side with a slot, in which work the ends of the roller axle, the length of the slot being determined by the distance the door has to travel and the relation between the circumference of the wheel and the axles. By this means the axle is caused to roll upon a horizontal plane, thus greatly diminishing the friction, and obviating the necessity of lubricating the working parts. In this manner, a permanently easy motion is ensured with a minimum of friction, the axle and its bearings not being worn away, as heretofore.—Patent completed.

2325 F. H. Danchell, Bolton. Utiliting fuel. Dated July 24, 1868.

The object is to supply coal or other fuel in a finely divided state, to close or shut up fireplaces, such as are used for generating steam, puddling, and other purposes. The fuel is blown in by the action of air or steam on to the bars. The invention consists in fitting in front of the furnace a hopper, provided with a rotary feeder, for regulating the supply: the fuel falls into an inclined spout leading to the furnace door. Just in front of the entrance, a steam or air pipe is connected; this pipe is provided with a cock, on opening which a rush of steam forces the fuel out of the spout, and distributes it over the bars, where it is consumed. The steam whichenters is likewise consumed; its action creates a draft and facilitates the consumption of smoke.—Patent completed.

2326 N. Barnaby, Lee, Kent. Sheathing ahips. Dated July 24, 1868.

The improvements consist in forming a cavity in the points of the rivets, which fusion the bottom plates to the frames, and to each other, in which cavity a softer motal in the store of the millstone paraily called with the preserving substance.—Patent completed.

2330 R. Young, Glasgow. Dressing millstones. Dated with the preserving substance.—Patent completed.

2330 R. Young, Glasgow. Dressing millstones per fusion to large the fusion and in arranging the tool to cut in both directions in each growe, whereby the groove is better for



bits are shaped to build together, with a cylindrical form, a little less than the socket, and the bottom corners of their central meeting edges are hollowed to grip the -Patent completed.

their central meeting edges are hollowed to grip the diamond.—Patent completed.

2331 T. WRIGLEY and W. E. YATES, Manchester. Looms. Dated July 24, 1868.

The improvements consist, first, in knitting or forming the healds in the or-linary manner, but constructing them wholly of a fine metal wire material, the upper portion being of a stronger or coarser quality than the lower. Second, in passing the warp threads when leaving the warp beam in their course to the healds over two fixed guide bars, and under a central or movable bar working between them; this central bar is supported in a parallel position with respect to the two fixed guide bars, and is connected at each end to the ends of a rod connected with and actuated by an eccentric on the crank, when in action. This movable vibrating bar regulates the tension of the warp threads during shelding and closing up, diminishing or preventing thereby any great or undue strain upon the warp during the time the shed is being formed. Third, the improvements relate to the temples, and consist in supporting the top temple roller in a swivel or adjustable cap, in which it is supported, and revolves on set screw centres, the box or bottom, or portion of the temple supporting the bottom roller or rollers, being connected by means of a swivel; and, last, the improvements consist in the employment of a flat or suitably shaped adjustable guard placed along and in front of the reed, closely above the open shed. This guard is employed to keep the shuttle in its course through the shed when passing from box to box, thus preventing the shuttle floating or leaving its course.—Patent abandoned.

232 W. E. GEDGE, Strand. Feeding boilers. Dated July 24, 1868.

2332 W. E. GEDGE, Strand. Feeding boilers. Dated July 24, 1863.

This consists in a method of feeding boilers with water. The boiler is surmounted by a reservoir, in communication with the boiler by two tubes; one of the tubes leads into the steam space and terminates in the upper part of the reservoir, the upper end of the other tube is connected to the bottom plate of the reservoir, and is fitted with a valve; the tube leads down into the water in the boiler. When the water sinks bolow a certain level, steam rushes up this tube, lifts the valve, and the water from the reservoir is then free to run down and raise the level.—Patent voir is then free to run down and raise the level .- Patent completed.

2333 B. G. GEORGE, Hatton-garden. Bronzing. Dated

July 24, 1868.

This consists in fitting a hopper above a roller; the bronze, as it falls through the hopper, is taken by the roller and distributed by another roller, below which roller rubs or bears against the paper or fabric as it passes round a drum. The paper being damp where the bronze is to be applied, it adheres thereto; a brush under the drum removes all superfluous powder.—Patent completed.

2334 J. H. JOHNSON, Lincoln's Inn. Iron and steel. Dated

2334 J. H. JOHNSON, Lincoln's Inn. Iron and lited. Dated July 24, 1868.

This relates to a process and furnace for manufacturing cast and wrought fron and steel, whereby the costly blast furnaces employed are entirely dispensed with. The furnace employed is constructed somewhat similar to a reverberatory furnace with a double sloping hearth for the collection of the molten metal. The hearth is heated either by an ordinary fireplace or furnace, or by gas, in which latter case a Siemens or other like apparatus well known to metallurgists would be employed, the flames and products of combustion entering by suitable conduits at one end of the furnace, and passing off by other like conduits situate at the opposite end. Upon each of the sloping sides of the hearth rest the lower ends of a number of vertical fireclay tubes or crucibles without bottoms, such tubes entering at their upper ends into holes in the roof of the furnace, which roof is covered by a cast-iron plate forming a platform, and being provided with movable lids which fit over the mouths of the different openings leading down into the tubes. The ore fluxes and fuel are suitably fed into the several tubes from the platform or plate above referred to, and heat is then applied to the furnace, the flames circulating or playing round the exteriors of the several charged tubes, and effecting the fusion of the ore without coming into setual contact therewith.—Patent completed.

2335 C. Ritchie, Upper Tulse-hill. \*\*Head dress\*\*. Dated

2335 C. RITCHIE, Upper Tulse-hill. Head dress. Dated July 24, 1868.

The patentee proposes to place upon the shoulders a strap, band, or other contrivance, for ensuring fixity to rack socket or arrangement for holding the stem or support which upholds the hat, hood, helmet, umbrella, or other like covering, over the individual.—Patent abandoned.

doned.

2336 J. Young, R. Pollock and J. Morrison, Paisley Prerenting smoke. Dated July 25, 1868.

This consists in causing a large portion of the fire gases which proceed from a furnace to pass again through the fuel along with the air necessary for combustion. In carrying out the invention, the ordinary inlets for air, both below and above the grate bars, are closed, and one or more flues are constructed so as to lead from the ordinary flue to the ashpit, or partly to the ashpit and partly to the space above the grate. A blowing fan or pump, to be worked by any convenient motive power, is arranged in connection with the added passages.—Patent abandoned.

2337 J. STEEL Glasgow. Washing casts. Dated July 25.

2337 J. STEEL, Glasgow. Washing casks. Dated July 25,

2337 J. STEEL, Glasgow. Washing casts. Dated July 25, 1868.

The apparatus comprises a large disc or chuck plate fixed on the overhanging end of a horizontal shaft, made to revolve backwards and forwards at any convenient speed. A series of cradles to receive the casks are arranged with their axes tangent to a circle on the face of the disc, and are mounted on journals connected by bevel gearing with each other, and actuated by gearing. The casks are placed in the cradles with their axes coinciding with the cradle journals, and when the machine is in action each has a rotation about its own axis, combined with the motion due to being carried round by the rotating disc. There may be two large discs one on each end of the shaft, and they may be provided with cradles for different sizes of casks. The gearing for imparting the axial rotation to the cradles consists of a bevel toothed ring encircling the main shaft, but fixed to the framing, and having in gear with it a bevel wheel on a radially disposed shaft carried upen the disc. This radial shaft rotates in consequence of being carried round by the disc, and it imparts motion by bevel gearing to one of the uradle journals.—Patent abandoned.

2338 J. GREENHALGH, Oldham. Cleaning cotton. Dated July 25, 1868.
The first improvement consists in a new mode of supplying the cotton or other material to the machine by means of a creeper and pair of fluted rollers, which are combined with a third roller placed in front of the pair and over the creeper. The creeper and rollers have not, however, a continuous motion given to them, as in other machines, but have an intermittent motion, that is, they stand still a certain time, then move on a certain quantity, and again stand still, and so on. This intermittent motion is effected by means of a toothed sector fixed on a large spur wheel, at every revolution of which it acts upon a pinion, from which motion is communicated to the creeper and feed rollers. It also consists in the application of a flap door or slide placed at the top of the machine, which is opened at proper intervals by means of antifriction bowls, turning on studs on a large spur wheel. These bowls, by acting on a lever, open or close the flap door or slide is closed whilst the operation of feeding is going on. The flap door is enclosed in a cowl into which the cleuned material is discharged on the flap door being opened. From the cowl, the cleuned material is carried away to a receptacle prepared for it either by a current of air or by another creeper, as may be convenient. The third improvement consists in varying the mode of feeding the material to the machine. A flake is used of the usual construction, but which is opened and closed by the action of the large spur wheel. The flake is held closed in its working position by a latch.—Patent completed.

2339 C. E. Brooman, Fleet-street, City. Drying tissues. (A communication.) Dated July 25, 1869.

working position by a latch.—Patent completed.

2339 C. E. BROOMAN, Fleet-street, City. Drying tissues.
(A communication.) Dated July 25, 1863.

This relates to apparatus in which the drying is effected by means of air. Within a chamber an apron or diaphragm of metallic cloth is fitted, on which the wool or other illamentous material to be dried is placed. This apron is supported by walls, which prevent the entrance of the air through anything else than through meshes or openings in the apron. Under the whole length of the apron is a compartment conflued by the walls, at one end of which a large pipe, to act as an escape pipe, is fitted, which pipe may be carried up through the roof of the building, or otherwise, and into which all the air drawn through the apron is made to pass. A double action air ferce pump is placed within another chamber in close proximity, wherein is also placed a reservoir in which the compressed air from the pump is collected. From this reservoir the compressed air passes through a pipe into the interior of the large pipe at the bend thereof, and, issuing up, the larger pipe sucks or draws the air from the compartment under the apron away to the outer atmosphere.—Patent abandoned.

2340 C. D. ABEL, Chancery-lane. Separating metals.

atmosphere.—Patent abandoned.

2340 C. D. Abell, Chancery-lane. Separating metals.
Dated July 25, 1868.

This consists, when the argentiferous alloy has been obtained (by "Parks" process in the separation of silver from lead by zinc), in submitting the alloy to successive liquidation processes, so to remove therefrom the greater portion of the lead combined therewith. This product, broken up into small fragments and mixed with its own weight of litharge, is thrown on to the bed of a reverberatory furnace. The bed of this furnace rests upon two cast-iron plates, made to incline towards each other in the centre. The alloy having been charged into the furnace, it is covered with a small quantity of litharge and it is heated to a dark red heat. The reactions then commence, one portion of the litharge is soon reduced by the zinc which is transformed into oxide, which remains floating in the molten mass, while the lead produced absorbs all the silver, and is caused to runoff through an outlet passage into a receptacle placed outside the furnace to receive it.—Patent completed.

2341 J. Brigham and R. Bickerton, Berwick-on-Tweed.

an outlet passage into a receptacle placed outside the fernace to receive it.—Patent completed.

2341 J. Brigham and R. Bickerton, Berwick-on-Tweed.

Drill rollers. Dated July 25, 1868.

This consists essentially in the construction of drill rollers composed or formed of a series of narrow discs or ring wheels. These narrow wheels being mounted on a hollow spindle, either plain, parallel along the outside, or made stepped, and eccentrically, in the reverse directions on the parts, where the eyes of the alternate wheels work, or have the cyes made large, and with flats or undulations on the bearings or on the shaft. It also consists in the construction and arrangement of the parts and mechanism for the regular delivery or deposit of seeds; also, in attaching a small seed delivery cylinder, open at one end and close at the other, to the usual horizontal revolving spindle for actuating the seed delivery mechanism, actuated by a toothed wheel from a corresponding wheel or pulley. Within the open end of the cylinder, an annular tapered ring plug is made to slide by two guiding and actuating rods, out through which the delivery cylinder revolves which rods may be actuated or regulated by a screw boss on the spindle, or a cross head and screw pin or lever on the side of the seed box, so as to push the plug into or out of the open ned of the cylinder, and so regulate the size of the openings at the bottom of the segmental checks, where they pass into the spiral channels leading to the holes out through the cylinder, to any desired size of seed, to deliver one (or more if desired), every time a wedge groove comes round.—Patent completed.

2342 A. V. Newton, Chancery-lane. Portable railway.

pleted.

2342 A. V. NEWTON, Chancery-lane. Portable railway.
Dated July 25, 1868.

This invention is based upon the self-rail laying principle, and consists chiefly in arranging on eithor side of a carriage a continuous or endless rail, or set of rails, with a corresponding arrangement of trucks adapted thereto, the trucks being connected into endless chains fitting around the rails. Each truck carries a set of rollers running on the rail, and turning in journals on the truck; they are kept in constant contact with the outside of the rail by means of an additional wheel working on the inside of the same. As the vehicle is drawn forward, or as the trucks ar moved on the rails by muscular or other power, each truck, as it comes to the ground, rests upon a foot formed upon it, while the rail is being carried forward over it, and is then carried up again in rear of the vehicle. On water craft, buoys instead of feet are provided, the same acting as paddles to convey the vessel forward.—Patent completed.

2343 L. Wray, Ramsgate. Separating metals. Dated

2343 L. WRAY, Ramsgate. Separating metals. Dated July 25, 1868.

The first object is to crush up the ore, and the second to triturate the ore or substance containing the metal until it is reduced to an almost impalpable powder. The

first machine consists of three or more grooved rollers, two of which are arranged to gear into each other, and the third is placed above and rosts on the lower ones, and by its weight crushes the ore, which in a divided state passes down to the other two, where it is ground or crushed up small, after which it passes through a bulling machine to the triturating machine. This triturating machine consists of a barrel or hollow eylinder provided externally with projecting grooves, hoops, flanges, rings, or other analogous dovices, which will admit of the cylinder or barrel being placed on and rolled along a railway, for the purpose hereafter explained. An opening is made in one end of the cylinder for the purpose of obtaining access to the interior; also, an opening for charging or discharging the machine. Inside this cylinder is placed a spherical roller, which may be either plain, serrated, or grooved on the surface, for more effectually acting upon and grinding up the substance. The amalgamating machine consists of a seemicircular trough, which is heated by means of a steam jacket below, and in this vessel is placed a shaft or axle, on which are mounted any number of metal discs, the surfaces of which may be plain or corrugated, and are to be amalgamated or prepared with mercury or amalgam, in the well-known manner, when treating auriferous and argentiferous ores. A quantity of mercury is also placed at the bottom of the trough, and the disc shaft is mounted in suitable bearings, which, if desired, may be removable or capable of being lifted out with the shaft. Rotary motion is communicated to the shaft and the discs thereon by causing a driving roller to rest on the top edge of the discs, and actuating this roller by any suitable gearing.—Patent completed.

2344 R. Newton, Leeds. Straightening fibres. Dated July 25, 1868.

completed.

2344 R. NEWTON, Leeds. Straightening fibres. Dated July 25, 1868.

This invention relates to the opening and straightening or fibres, by the use of endless sheets, furnished with steel pins or combs, and so arranged as to clear each other at the same time that they straighten the fibres passed through the machine. The fibre is hwhich the machine is chiefly designed to operate are flax, and hemp, tow, jute, and waste silk. The fibre is fed into the machine, between two encless sheets furnished with steel pins. From these sheets it is delivered to or stripped off, by a rapidly moving endless sheet of combs, fitted with stripper batts, which, when brought into action, push the fibre from the combs, on to an endless sheet of hackles. This sheet of hackles carries forward the fibre to a pair of delivery rollers, which deliver it in an opened and straightened state out of the machine.—Patent completed.

2346 W. R. Lake, Chancery-lane. Boilers and feeding.

hackles carries forward the fibre to a pair of delivery rollers, which deliver it in an opened and straightened state out of the machine.—Patent completed.

2346 W. R. Lake, Chancery-lane. Boilers and feeding. (A communication). Dated July 25, 1838.

The exterior shells of the boilers consist of a series of plates of boiler iron bent and riveted together, so as to produce a long flattened boiler with convex ends, tied together by the perforated vertical longitudinal partition plates. Each of the chambers is divided by the vertical tranverse partition plates into separate compartments, the partition plates being only but half the height of the boilers in which they are fixed. The boilers are arranged, so that one will be directly above the other, a return flue being left between them. The overflow pipes are each secured in a vertical position, and extend through the shells of the boilers, the lower end of each pipe opening fully into the lower boiler without projecting downwards into the same, and the upper end of each pipe projecting into the supper boiler, and opening into the same at the intended water line or at about half the height of the boiler. The two boilers are intended to be "walled in," in any suitable manner, so as to afford a fire space or furnace under the front end of the lower boiler, with a direct flue extending back therefrom, and up behind the rear on i of the boiler, into the return flue, left between the two boilers, the latter flue being continued upwards in front and back, over the top of the upper boiler, to an escape flue or chimney. The float is a large hollow airtight sphere of thin metal, with a rigid stem fitted to slidensily through a stuffing box, fitted on the upper boiler. The lower side of the case communicates with the boiler, through an opening, and its upper side communicates with a opening through one of its sides, and is fixed concentrically upon a shaft, so that it can be rotated thereby, in a case which is lixed upon the top of the upper boiler. The lower side of the ca

# APPLICATIONS FOR LETTERS PATENT.

Date February 2, 1869
310 R. Caunce, Manstleld, Nottinghamshire, and M. G
and B. Bradley, Nottingham. Improvements in machinery or apparatus for twisting yarns and other threads
of cotton, wool, silk, or other fibrous substances.
311 C. Hoult. Phænix Japan Works, Wolverhampton,
Staffordshire. Improvements in screens or shields for
closing or partially closing or covering domestic and other
like fireplace openings when not in use for heating purposes.

rear of the vehicle. On re provided, the same ressel forward.—Patent sessel forward.—Patent sessel forward.—Dated the ore, and the second. It containing the metal papapable powder. The



215 D. Joy, Saltburn, Yorkshire. Improvements in means and apparatus for extracting oils and other liquids from the substances in which they are contained.
216 S. Brocke, Brighouse, Yorkshire. Improvements in, er applicable to, condenser carding engines.
217 A. E. Harris, Mile End-road, Middlesex. An improved method of making artificial teeth.
218 W. I. Palmer and W. P. Goulding, Reading, Berks. Improvements in evaporating and calcining alkaline solutions which have been used to boil vegetable fibrea.
219 W. A. Smith, Manchester. Improvements in the preservation of meat, fish, and other perishable articles of food during their carriage by railway.
220 J. Bird, Kingswinford, Staffordshire. Improvements in kilns or ovens for drying and burning bricks and other articles of pottery or carthenware.
221 W. E. Newton, Chancery-lane. Improvements in the construction of the permanent way of railroads, and in the means of securing or fastening the various parts. (A communication).
222 H. Bate, Hackney-road, Middlesex. A new or improved top.
232 C. W. Brabazon, Broomfield House, Mahahide

improved top.

323 C. W. Brabazon, Broomfield House, Mahahide, Ireland. An improved iron chain net for oyster dredges.

323 C. W. Brabazon, Broomfield House, Mahahide, Ireland. An improved iron chain net for oyster dredges.

Dated February 3, 1869.

324 V. Baker, Aldershot, Surrey. Improvements in vessels for containing hot liquids.

325 J. Slater, Fitzroy Works, Euston-road, Middlesex. Improvements in railway carriages.

326 J. G. Willians, St. Stephen's-crescent, Paddington. Improvements in the manufacture of iron and steel.

327 J. Macintosh, North Bank, Regent's Park. Improvements in ornamenting surfaces.

328 J. H. Tyrrell, Hadleigh, Bochford, Essex. An improved method of measuring and drawing off any given quantity of liquid from a vat or other vessel containing it in bulk, and in registering the quantity so drawn off or abstracted from time to time.

329 A. S. and A. R. Stocker, Lamb's Conduit Works, Artillery-street, Horsleydown, London. Improvements appertaining to Infants' feeding and other bottles.

330 C. D. Abel, Southampton-buildings, Chancery-lane. The production of a new or improved hydraulic cement or artificial stone. (A communication).

331 F. Vaudersey, Ucele, Belgium. Improvements in apparatus for the manufacture of bricks and other articles moulded or formed from clays and other plastic material.

332 C. E. Brooman, Fleet-street, City, patent agent. Improvements in the construction of corsets or stays. (A communication).

communication).

333 W. Lister, Liverpool. Improved means and apparatus for filtering saccharine solutions and syrups. (A

ratus for filtering saccharine southons and communication).

334 W. Maddick. Manchester. Improvements connected with the internal fire tubes of locomotive marine and other bollers.

335 R. B. Frobock, Boston, Suffolk, Massachusetts, U.S.A. An improved machine for making lasts.

336 J. R. Johnson, Haymarket, Middlesex. Improvements in the manufacture or production of photographic ments in the manufacture or production of photographic ments in the manuscentre of process.

337 L. Wray, Ramsgate, Kent. An improved process for carbonizing and hardening wrought iron.

338 A. V. Newton, Chancery-lane. Improvements in sewing machinery. (A communication).

339 J. Howard, Bedford. Improvements in the construction of turn-wrest ploughs.

239 J. Howard, Bedford. Improvements in the construction of turn-wrest ploughs.

Dated February 4, 1869.

340 H. and J. Bryceson and T. H. Morten, Stanhopestreet, Euston-road, St. Panoras, Middlesex. Improvements in the construction of organs, and in the application of electricity and hydraulies thereto.

341 T. Parkinson, Liverpool. Improvements in, and connected with doors for regulating the admission of air to furnaces.

connected with, doors for regulating the sumission of air to furnaces.

342 J. J. Bagshawe, Thames Steel Works, Sheffield, and W. F. Betho, Birmingham. Improvements in machinery for manufacturing semolina and flour, and in apparatus for producing portions of such machinery.

343 E. D'Artois, Charlotte-street, Filzroy-square, Middle-sex. An inkstand which is called d'Artois's inkstand.

344 T. and T. Pankhurst, Clover-street, Chatham, Kent. Improvements in gully traps.

345 E. Lord, Tormorden, Yorkshire. Improvements in furnaces for steam boilers and other purposes.

346 P. Jensen, Chiswell-street, Finsbury-square, City. Mode of utilizing the motion of the waves relatively to that produced by them on the ship, for the propelling of the same, or for other useful purposes. (A communication).

same, or for other useful purposes. (A communication).

347 R. W. Mnowles and G. Green, Tong, near Bolton, Lancashire. Improvements in machinery or apparatus for stretching, swissing, and finishing muslins or other similar fabrics.

348 J. Vavesseur, Gravel-lane, Southwark-street, Surrey. Improvements in apparatus for working heavy guns or ordnance.

Improvements in apparatus for working neavy guns or ordnance.

349 E. Morewood, Rock Cottage, Briton Ferry, Glamorganshire. Improvements in the manufacture of tin and terne plates.

350 G. Bray, Deptford, Kent. An improved slip hook.

351 W. E. Newton, Chancery-lane. Improvements in elevated and other railways. (A communication).

352 H. Jones, Duchess-street, Portland-place, St. Marylebone, Middlesex. Apparatus for sounding tuning forks.

Dated February 5, 1869.

353 G. and E. Ashworth, Manchester. Improvements in the method of manufacturing paper fasteners, and in the apparatus employed in the manufacture thereof.

354 J. Joheon, Derby. Improvements in explosive projectiles.

364 J. Jobson, Derby. Improvements in explosive projectiles.
355 F. Braby, Camberwell, Surrey. Improvements in the treatment and utilization of the waste solution of sulphate of from resulting from the cleansing of fron surfaces in the process of galvanizing.
356 W. Blundell, Upper Thames-street, City. Improvements in guards or apparatus applicable to chimneys for the prevention of down draught.
357 J. Page, Glasgow. Improvements in pipe joints, and in cement for the same, and applicable otherwise, and in cement for the same, and applicable otherwise, and in cement for the same, and applicable otherwise, as J. Henderson, Leith, Mid Lothian. Improvements in surface condensers and refrigerators.
359 W. Adams, Carlisle-terrace, Bow, Middlesex, and W. G. Beattie, Surbton, Surrey. Improvements in the bearing springs of carriages, trucks, and engines used on railways and common roads.
360 J. Taylor. Britannia Works. Eirkenhead. Chester.

Improvements in machinery or apparatus for raising, lowering, and conveying bodies.

361 J. H. Johnson, Lincoln's Inn-fields. Improvements

Improvements in machinery or apparatus for raising, lowering, and conveying bodies.

361 J. H. Johnson, Lincoln's Inn-fields. Improvements in mounting and working ordnance. (A communication).

362 J. Halford, Brettel-lane, Kingswinford, Staffordshire. Improvements in puddling furnaces used in the manufacture of iron, and in other reverberatory furnaces, as A. Clark, Chancery-lane. Improvements in mules for spinning yarns. (A communication).

364 A. Browne, King William-street, City. A process for the direct decomposition of neutral fatty substances for the manufacture of stearlne. (A communication).

365 D. D. Kyle, Victoria-street, Westminister. Improvements in the means of, and apparatus for, communicating or signalling in and with railway trains.

366 C. G. Hill, Nottingham. Improvements in the manufacture of rosettes and trimmings.

367 C. S. Dawson, Thames Ditton, Surrey. An elastic stamp for printing on paper, linen, parchment, wood, stone, glass, metal, or any other suitable material.

368 H. A. Dufrene, Rue de la Fidelite, Paris. Improvements in the manufacture of ice, and of the agents employed therein, and in the apparatus connected therewith (A communication).

369 J. S. Offord, Norwich, Norfolk. Improvements in apparatus for clipping and shearing the coats of horses and other animals.

370 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in puddling and other furnaces employed in the manufacture of wrought iron and steel. (A communication).

371 R. Snook, New-street, Horselydown. Improvements in cocks, taps, and valves for regulating the supply of steam or water or other fluids.

372 J. C. Shaw, Patricroft, near Manchester. Improvements in machinery or apparatus for cutting wire and rods of metal and other materials. (A communication).

373 J. T. Edmonds, City-road, Middlesex. Improvements in machinery or apparatus for giving medicines and drinks to horses and other cattle.

374 H. A. Bonneville, Sackville-street, Piccadilly. A new and improved compound for preparing jolly broth, (A com

esparto grass, straw, and other fibrous substances in the working and incinerating of the residue resulting from

working an evaporation.

376 E. Meldrum, Dechmont, Linlithgowshire, Improve

evaporation.

376 E. Meldrum, Dechmont, Linlithgowshire. Improvements in the manufacture of parafiln oil.

377 T. Harrison, Burton-road, Lincoln. Improvements in corn, seed, and manure drills.

378 B. Walker and W. Tilson, Lenton, Nottinghamshire. Improvements in jacquards, and in reading machines connected therewith, and in the means or apparatus employed therein.

Dated February 8, 1569.

379 E. W. Hawes, Balmoral Lodge, Clintarf, Dublin. Constructing buoys and other floating sea marks according to the drawings and provisional specifications herewith annexed.

380 T. Nichols and J. Parr, Talke, near Lawton, Chester. Improvements in signal bells.

381 L. Strauss and A. Seckbach, Watling-street, City. Improvements in the method of, and apparatus for, preserving, improving, and discharging beer and other beverages. (A communication).

332 E. J. D. Fossard, Paris, Rue Albouy. An improved clyster-pump.

332 E. J. D. Fossard, Paris, Rue Albouy. An improved clyster-punp.
383 R. W. Row, Alton, Hants. Improvements in solitaires, links, and fasteners, applicable to gloves, belts, bands, and other like articles.
384 J. H. Johnson, Lincoln's Inn-fields. Improvements in steam engine governors. (A communication).
385 O. Sarony, South Cliffs, Scarborough, Yorkshire. Improvements in photographs to give them artistic effect, and to produce enlarged and permanent pictures from small negatives.
386 W. R. Lake, Southampton-buildings, Chancery-

to produce characteristics.

I negatives.

W. R. Lake, Southampton-buildings, Chancery-An improved lining for puddling and other furs.

A communication.

W. R. Lake, Southampton-buildings, Chancery-Improvements in knitting machines. (A commu-

lane. Improvements in knitting machines. (A communication).

388 B. Hunt, Serle-street, Lincoln's Inn. An improved manometric-barometric apparatus and vacuum gauge, applicable also as a safety valve. (A communication).

389 H. J. Richman, Porchester-terrace, Middleex. Improvements in fans or apparatus for forcing or drawing air. (A communication).

390 F. Jenkin, Fittis-row, Edinburgh. Improvements in apparatus for producing electric light.

NOTICES OF INTENTION TO PROCEED WITH

PATENTS.

From the "London Gazette," February 9, 1869.

2973 J. Robinson. Ploughs.

2976 J. Wadsworth. Apparatus for economizing fuel.

2980 E. T. Hughes. Gas burners. (A communication).

2981 A. H. Brandon. Watch-case spring. (A commuleation).

nication).
2987 E. Horton. Chandeliers.
2989 W. Gadd and J. Moore. Looms for weaving.
2990 H. Jewitt. Apparatus for playing a new game. (A communication).
2991 V. Juge. Apparatus for propelling and steering

2991 V. Juge. Apparatus this. 2992 J. Mabson. Candlesticks. 2992 J. Mabson. Candlesticks. 2995 W. Bichardson. Machinery for burring wool. 3009 J. F. G. Kromschroeder. Apparatus for generating an inflammable gas. 3010 J. Murray and O. Harling. Preventing the escape of smoke from steam boilers. 3011 D. and D. Crichton and W. Donbavand. Looms for weaving.

f smoke from steam bollers.

3011 D. and D. Crichton and W. Donbavand. Loon or weaving.

3015 A. Thorpe. Chairs, cages, or hoists.

3019 G. Holcroft and W. N. Dack. Steam engines.

3022 A. Monsnergue. Kill for burning clay.

3023 N. Henwood. Reaping machines.

3025 S. Bates and W. Redgate. Manufacture of lace.

3026 C. E. Brooman. Treatment of fatty matters. (

3026 C. E. Brooman. Treatment of latty matters. (A communication).
3027 T. C. Parsons. Skates.
3029 Z. Shrimpton. Packing needles.
3030 J. Baker. Apparatus for removing animal and ve, etable adherious from the bottoms of iron vessels.

3103 J. Rogers. Reviving bone black after it has been xhausted by sugar refining, &c. (Partly a communica-

on). 3034 E. A. Cowper. Manufacture of iron and steel. 3039 C. F. Galand and A. Sommerville. Repeating fire-

ma, 3043 J. R. Wigham. Illuminating lighthouses, 3044 G. Graveley. Steam pumps. 3056 D. Marshall. Packing for the tubes of surface con-

3066 J. Watson. Manufacture of wall papers.
3064 J. Watson. Manufacture of wall papers.
3068 W. Richards. Cartridges.
5073 J. Barcroft. Manufacture of felted cloth.
1076 T. Sagar and T. Richmond. Looms for weaving.
3079 J. H. Johnson. Saw handles. (A communica-

tion).
3081 J. Steel. Apparatus for obtaining extracts from

asted malt.

3092 A. M'Millan. Buttons of fastenings.

3098 H. Deacon. Manufacture of sulphuric acid.

3125 A. Field and A. W. Tuer. Manufacture of show-

oards. 3168 R. M. Marchant. Permanent way of railways. 3171 W. E. Newton. Manufacture of syrup. (A com-

munication).
3190 A. Clark. Submarine telescopic lantern. (A communication).
3219 J. J. Parkes. Stoves.
3372 J. Parrott and W. Jones. Machinery for beetling

3372 J. Parrott and W. Jones. Machinery for beetling voven fabrics.
3388 J. Sturrock. Metallic caps for bottles.
3397 R. Milfardy. Implement for beeing land.
3497 A. Clark. Machinery for making ginger snaps. (A ommunication).
3515 C.D. Abel. Manufacture of phosphorus. (A communication).

aunication).
3560 W.E. Newton. Manufacture of felted fabrics. (A

3560 W. E. Newton. Ananufacture of total accommunication).

3572 W. Dinwoodle. Fences,
3638 B. Hornsby and J. E. Phillips. Reaping machines,
3800 T. Lynch. Preventing collisions on railways.
3831 F. Ryland. Metallic lids for saucepans.
34 D. Nicoll. Clothing.
138 B. Craig. Manufacture of paper.
222 J. M. Merrick. Composition for various useful purposes in the arts.

## LIST OF SEALED PATENTS.

Scaled Febr	uary 5, 1869.
2333 B. G. George	2529 R. Sim
2460 W. Pearson, W.	2574 J. Briggs
Spurr, and H. Brad-	2626 A. F. Eckhardt
bury	2639 B. J. Cohen
2461 J. Hargreaves	2656 S. R. Samuels and J.
2465 W. R. Lake	Birks
2472 J. Whitehead	2690 J. Wilkinson
2474 H. Benjamin	2904 P. E. L. W. Stock
2481 J. Broadfoot	man
2496 W. W. Hughes	3335 J. Vavasseur
2507 A. Argamakoff	3681 J. Littler and J. H.
2512 J. Winsborrow	Banks
2517 C. D. J. Seitz	3732 J. Fitter

Souled February 0 1000

Souled repri	1ary 9, 1869.
2510 E. P. G. Headley	2540 H. K. York
2511 D. Hill, J. Richard-	2569 W. Corbitt
son, G. N. Duck, C.	2743 W. E. Newton
G. Johnson, and W.	2747 J. Wood
F. Masterman	2755 A. V. Newton
2516 H. H. Henson	2815 W. R. Lake
2518 J. Wilson	2859 W. R. Lake
2519 R. H. Southall and	8001 J. Woollatt and W
W. Hallam	B. Dodds
2525 W. Payne	3144 W. R. Lake
2533 J. Grant	3532 W. R. Lake
2539 T. R. Crampton	3619 W. E. Newton
2557 J. H. Dearle and T.	3687 W. R. Lake
Brown	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

853 W. Renney	372 W. Richards
356 T. Spencer	376 J. A. Maxwell
362 E. A. H. Beuther	386 J. Townsend
369 U. Scott	404 J. Rock

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

311 A. C. Bamlett 463 W. Hamer 330 W. H. Bartholomew 509 J. Imray

PROVISIONAL PROTECTION FOR SIX MONTHS
Has been granted upon Specifications bearing the following numbers:—

	1	1	1	,		1	
3009	118	191	206	218	231	244	257
3015	120	195	208	219	232	245	258
3677	144	196	209	220	233	246	259
8691	149	197	210	221	234	247	260
3837	163	199	211	228	236	248	262
3933	177	200	212	224	237	249	263
8945	179	201	218	226	238	251	264
24	183	202	214	227	239	252	266
34	185	203	215	228	240	254	265
63	187	204	216	229	241	255	270
75	189	205	217	230	248	256	272

LIST OF SPECIFICATIONS PUBLISHED. For the week ending February 6, 1869.

	<i></i>		1								
No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
1968 1988 1991	1 2 0 8	2034 2035 2051 2063	0 10 0 4 0 8 0 6	$\frac{2081}{2083}$	0 4 0 10 0 4 0 10	2090 2092 2095 2106	0 4 0 4 0 4	$2108 \\ 2112$	0 4 0 4 0 4	2117 2118 2125 2128 2542	0 4 0 4 0 4



#### **MECHANICS'** MAGAZINE.

LONDON: FRIDAY, FEBRUARY 19, 1869.

DR. TYNDALL'S RESEARCHES LIGHT.

IN a recent Royal Institution lecture, as already published in these columns, Professor Tyndall exhibited some experiments tending towards the explanation of the long-standing puzzle of the blue colour of the sky. A few detailed particulars as to the condi-tions necessary to obtain the blue cloud seen in his experiments may not therefore be un-interesting. He has several tubes in which the clouds are produced, the one commonly used being a yard long and two and a-half inches in diameter. As we have already explained, the common air used in the experiments is purified from dirt by filtration through cotton wool, after which the carbonic acid is removed by the passage of the air through pumice stone soaked in caustic potash, and, lastly, it is dried by means of some sulphuric acid and nowdered class consome sulphuric acid and powdered glass consome surprire acid and powdered glass con-tained in a second U-tube. The purified air is then charged with any desired vapour by permitting it to bubble through a liquid from which it takes up the vapour. The liquid is contained in the bottom of a little Woulfe's bottle made of a test tube, with one length of glass tube passing through the cork and below the surface of the liquid, while the second and shorter piece of tube merely pierces the cork, and has its outer end connected by means of a stopcock with the experimental glass cylinder. This great tube is first exhausted of air, and then, when the stopcock con-nected with the Woulfe's bottle is turned on, the air rushes from the room through the cotton wool, the purifying agents, and the liquid in the Woulfe's bottle, and enters the great hollow glass cylinder more or less charged with vapour. The great tube has transparent ends of glass, so that the beam from the electric lamp may be sent along the axis of the tube, and the action of the light upon the vapour be observed. The beam may be made to assume a conical form, or may pass in parallel rays, according to the position of the condensers of the electric lamp.

Some of the vapours tried in the experiments resisted the action of light, but a second vapour, tending to produce a decomposing action upon the first one, was sometimes also admitted, and the admission of the light into the tube then produced sufficient molecular motion to begin the decomposition. In one of the earlier experiments, the tube was charged with half an atmosphere of air and nitrite of butyl vapour, and half an atmosphere of air which had been permitted to bubble through commercial hydrochloric acid. When the beam of light was sent through these vapours, the action paused just long enough to show that the tube was optically empty; then a cloud was formed which began blue, but advanced to whiteness so rapidly as to justify the assertion that the whole action was practically intion that the whole action was practically instantaneous. It remained, therefore, to try to lengthen the time of this action, and to bring the blue colour more under observation. In another experiment, as reported by Dr. Tyndall to the Royal Society, "the mixed air and nitrite of butyl vapour was permitted to enter it, until the associated mercury column was depressed 1-10th of an inch. In other words, the air and vapour, united, exercised a pressure not exceeding 1-300th of an atmosphere. Air, passed through a solu-tion of hydrochloric acid, was then added, till generally turned when a new feature in the mercury column was depressed 3in. The

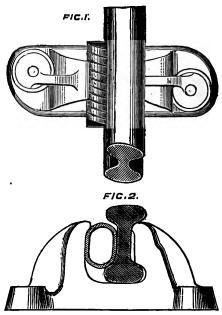
condensed beam of the electric light passed for some time in darkness through this mix-ture. There was absolutely nothing within the tube competent to scatter the light. Soon, however, a superbly blue cloud was formed along the track of the beam, and it continued blue sufficiently long to permit of its thorough examination. The light discharged from the examination. The light discharged from the cloud at right angles to its own length was perfectly polarized. By degrees, the cloud became of whitish blue, and for a time the selenite colours obtained by looking at it normally were exceedingly brilliant. The direction of maximum polarization was discretized at wight angles to the illuminating tinctly at right angles to the illuminating beam. This continued to be the case as long as the cloud maintained a decided blue colour, as the cloud maintained a decided blue colour, and even for some time after the pure blue had changed to bluish white. But as the light continued to act, the cloud became coarser and whiter, particularly at its centre, where it at length ceased to discharge polarized light in the direction of the perpendicular, while it continued to do so at both its ends."

The vapours were also tried in a more attenuated condition, and were found to produce a blue equally rich, but more durable. The blue colour is not visible in daylight, but only when the cloud is itself the chief source of luminosity. The cloud acts like a Nicol's prism, for when a real Nicol's prism is placed between the experimental tube and the lamp, if the cloud looks of a rich blue, when viewed from above or below, the effect wholly disappears when viewed in a horizontal direction. Supposing the water par-ticles in the atmosphere of the earth to take the form of incipient cloud, as is the case with the vapours used in these experiments, the fact is sufficient to account for the blue colour of the sky. It is true, that the polariz-ing angle of the light of the sky is not the same as that of water, but, says Dr. Tyndall, "whenever the precipitated particles are sufficiently fine, no matter what the substance forming the particles may be, the direction of maximum polarization is at right angles to the illuminating beam, the polarizing angle for matter in this condition being invariably 45deg." Motes in liquids will polarize light. Professor Tyndall states that a cell of distilled water in front of the electric lamp will polarize the light very slightly, but when a piece of soap is agitated in the water above the beam, the light becomes so polarized that selenite can be made to flash out the usual vivid colours under the action of the ray; a drop of "hair-wash," or of mastic dissolved in a large excess of alcohol, will produce the same

# COILED IRON RAILWAY KEYS.

MANY attempts have been made to supersede the wood keys, by means of which rails are held in place in their chairs, by keys both of wrought and of cast iron. Some systems have failed on account of their complex and expensive character; some from the inherent and ineradicable defects they were found to possess; whilst others, of a more practical nature, have not got beyond the ordeal of experimental trial. This has been owing, in England, either to want of patience or cash—more frequently the latter on the part of inventors, or from an objection, on the part of railway managers, to depart from the ordinary method of keying the rail in the chair. In India, however, where the influences of the climate and the ravages of the insect tribe render wood the least desirable material for permanentrallway purposes, iron is readily adopted, its primary expense, heavy though it is, being a far smaller and less serious matter than that of the constant renewal of timber, and the

could fill several columns of our paper in merely describing the various methods which have been proposed for fastening rails in chairs with iron keys, were we disposed to do But such is not our present purpose, our object being to bring before our readers an excellent form of railway key which has just been introduced to public notice by Messrs. Thomson and Browning, of 3, Victoria-street, Westminster. This is the patent coiled iron key, which is shown, as applied to an ordinary railway chair, in the accompanying cuts, in plan at fig. 1, and in elevation at fig. 2. These



keys are the invention of Messrs. Muir and M'Ilwham, of the Anderston Foundry, Glasgow, and they are made by coiling a flat gow, and they are made by coming a nate strip of iron upon a steel mandril of the required form. They are coiled cold, so as to preserve the elasticity of the iron, and are finished by being warmed and dipped in boiled linseed oil, which forms a strong weatherproof varnish upon them. They are easily driven, either in or out, with a rammer made for the purpose, but they cannot work loose in the chairs. They grip the rail firmly, but without rigidity, and require no tightening up or attention, when once fixed in place, and they are as durable as the chair itself. We understand that, after a sufficient trial, it has been decided to introduce the use of these keys generally on the Great Indian Peninsular Railway. We may add that the keys for a 75lb rail weigh a little over 2lb each. Railway engineers would find these keys advantageous in this country, where wood keys are generally short lived, and require constant attention. In India, however, and in some of the colonies, where wood keys are practically useless, the coiled iron key will prove an undoubted boon, and, we should think, will meet with general adoption.

# STORM SIGNALS.

RESPECTING the subject of storm signals, our contemporary, "Scientific Opinion," appears to be a year or two behindhand in its information. The number for the 10th inst. has an article headed "Weather Science," which, after stating that meteorology "has, up to this, failed to give us any satisfactory means of predicting the weather," rather unreasonably goes on to deprecate the dis-continuance of the late Admiral Fitzroy's storm warnings, and to urge their resumption. Now, the fact is, the Meteorological Committee have been issuing the storm warnings, in a modified form, regularly since the commence-ment of 1868. It is true, that they employ risk of accident from defective joints and sleeperage. To India, therefore, attention is generally turned when a new feature in iron permanent way makes its appearance. We the MECHANICS' MAGAZINE has repeatedly

advocated; nevertheless, from all that we can ascertain, the signals, combined with "tele-graphic weather intelligence," also issued by the Meteorological Office, are greatly appreciated by the shipping and seafaring community. More than 100 stations on our coasts nity. More than 100 stations on our coasts hoist the drum upon information received from the Meteorological Office of impending gales or their actual advent upon some portion of our shores, and a like signal is duly made at all our home naval ports. Several foreign ports, Hamburg among them, receive warnings from this country, and exhibit a similar signal. The Meteorological Committee have also under trial, "wind semaphores" at Liverpool, Shields, and in the Thames at Blackwall. By means of this apparatus, it is proposed to indicate the direction of wind and its force, whenever dangerous and threatening, as well as the district from which it was reported to the central office; so that shipowners, shipmasters, and underwriters may form their own opinion as to the probable extension of the gale, and the advisability of ships leaving port under the circumstances. All this should have been known to a writer professing to give a scientific opinion; and, if known, its pretensions should have been duly considered, although the system may not go the length advocated by him and desired by ourselves.

# MANUFACTURE OF CAPS AND CARTRIDGES.

No. III.

IN our last article we described the manufacture of the facture of the caps constituting a portion of the entire cartridge. Cotemporaneously with their fabrication is carried on that of the small copper sockets forming the base of They are cut out of yellow the cartridge. copper, which arrives at the establishment in the form of narrow strips, having a breadth of two and a-half inches. This width is sufficient to permit of three sockets being cut out of it, and the operation is performed by means similar to those employed for the manufacture of the caps. They consist of a die and punch, the latter being furnished with a small circular knife, which cuts the edges of the copper so soon us the stamping is effected. At the close of a full day's work, these machines can show that they have turned out each 150,000 of these sockets. These emerge from the punch in a greasy state, similar to the caps; but, unlike the former, the operation of cleaning them is not immediately carried into effect. It depends upon what description of cartridge they are intended for. Some are are their greasy condition to the factory at Rue Amelot, or to that at Moulineaux, while others are despatched to the establish-ment at Rue Nôtre-Dame des Victories. If they are intended to be used in small arms upon the Flobert principle, whether pistols or cavalry carbines, they have to undergo an enlargement in the direction of their length, so as to be able to contain the whole of the cartridge, instead of merely constituting the base of it. In this case, they are annealed, cleaned, and lengthened by being passed through a mill, which carries a couple of punches, and punches them out to the required size. They are subsequently polished by friction, in a manner similar to that employed for the caps. The sockets destined for central-fire cartridges differ from the other descriptions, by being furnished with a brass cup or chamber in which the priming is placed, and which also carries a small knob answering to the nipple in percussion fire-arms. This little cup is cut out of strips of brass in a very ingenious and rapid manner, by the aid of a machine consisting of a punch and die. The sheath, so to call it, is cut out, stamped, and cleft, the edges of the cleft portions being slightly turned up, and giving it the appearance of the calyx of a flower, with the extremities of the petals raised a in bundles of four at a time, are brought under to a minion to barrel C, secured to the lever D at the bottom of the lock E, which is placed in the centre of the stock F. The striker G is within the breech-piece A, and works easily with the extremities of the petals raised a in bundles of four at a time, are brought under

little upwards. Motion is communicated to the stamping machinery by rods and eccentrics, and 170,000 cups is the daily work of each machine. These chambers or cups carry the needle or percussive agent, which are of brass wire, cut into lengths, and placed in a triangularly shaped hopper, from which they drop, one by one, in order to undergo sharp-ening, by the action of a small lathe, strongly resembling those used in manufacturing the axles of wheels in clockwork. The knobs or nipples are also made from brass wire, the cross section of which gives a star with four branches or arms at right angles to one another. These, together with the envelopes, may be regarded as the principal component parts of the cartridges, and the manner of putting them together will be fully described as we proceed with the subject.

Felt and pasteboard are the chief components of which the envelope, or cartridge proper is constructed. The wads are made of the former material, and constitute a separate branch of industry, no fewer than eighty persons being employed upon them alone. In the first place, the felt has to be specially manufactured, and the hair of calf skin, in the incipient stage of tanning, is selected as the proper material. This hair, or the coats, as they may be called, are subjected to a preliminary beating, and then placed in a ma-chine to be teased. This machine is composed of a series of cylinders, which separate the hairs. They are then acted upon by a cylinder furnished with brushes, and being drawn up by a powerful blast from a ventilating machine, arrange themselves between the grooves of a couple of other cylinders. Subsequently, they are drawn out in the form of a sheet, and spread upon an endless band having a very slow motion. At the same time, three cylinders revolving with a reciprocating motion exert a certain degree of friction upon the hair, which commences the felting and produces a "galette." These "galettes," which are of the same consistency as what hatters term "hat body," are passed on to the workmen who finish the felting. For the workmen who main the fetting. For this purpose, they are dipped in water con-taining about one per cent. of sulphuric acid, and beaten and compressed with a roller of wood, until they assume the character of a piece of solid stuff. The finishing felting process is also accomplished by machinery. Instead of being beaten and polished by hand labour, the "galettes," after being steeped in the acidulated water, are wound round iron shafts, revolving slowly on the top of an iron table which moves with a come-and-go motion. The hair compressed between the shaft and the table speedily becomes incorporated, and endowed with a firm homogeneous texture. Directly this operation is completed, the pieces of felt are made up in bundles, and subjected to a strong pressure in a hydraulic press, which forces out any moisture they may contain. After being dried, they are steeped in a mixture of rye flour and glove powder, in which there is a small quantity of the parings of the skins of which gloves are made, and which serves to give a consistency to the mixture, which it would not otherwise possess. Again the pieces of felt are put under the hydraulic press, and again consigned to the drying room, and, when completely dry, a strong coating of the paste is spread over them, upon which paper is laid. A third visit to the drying room, where it is necessary to raise the temperature very high, in order to cause the paper to adhere very closely, completes the operation. In their finished state, the pieces of felt are taken to the cutting machine, where the wads are cut, or, rather, punched out, in a manner very similar to that employed in the case of the metal plates already described. Each of these machines can turn out a quarter of a million

the action of the punch by a bar having two motions. The one is a lateral motion, taking place at the fall of each wad, and the other, a movement from back to front, occurring so soon as each sheet is removed. These motions are calculated with such precision that there is very little slip. In the other machines, the feeding is done by hand. The shape of the wads is tested by the hand, but the thickness is ascertained by the aid of a small and ingenious machine. In the case of rifles, and what are termed arme de precision, the length of the cartridge must be regulated to a nicety. A discrepancy amounting to 0.04 of an inch would be sufficient to seriously interfere with the accuracy of the weapon. There must always exist a trifling difference in the thickness of the envelopes, since it is absolutely impossible to cover felt with paper, in a manner that will insure perfect uniformity in this respect. The separation or sorting of cartridges that have different thicknesses is effected by placing upon an endless band a certain number of wads, the shape of which has been previously ascertained to be correct. At a given distance along the band, a grooved cylinder is placed, which allows the wads only to pass that have a thickness less than 0.36 of an inch. These are arrested by a second cylinder, furnished with sharp points, which takes them up, carries them round as the shaft rotates, and brings them into contact with a copper comb. They are brushed off the points by this comb, fall into an inclined trough, and are ultimately deposited in a box placed for the purpose. The first batch is thus accounted for, and it remains to be seen how those having a still less thickness are disposed of. Manifestly, the next in order, or those having a thickness of 0.28in., will not be taken up by the points of the first cylinder, but will be carried on by the motion of the endless band. So soon as they have left the first cylinder a little behind, they are, in their turn, caught by the point of a second cylinder, treated in the same manner as those they were just separated from, and deposited in a separate receptacle. A third batch having a thickness less than a quarter of an inch, is seized upon in a similar manner, by a third cylinder, and finally conducted into a box placed at one end of the apparatus. The whole of these operations are conducted with great rapidity, smoothness, and precision.

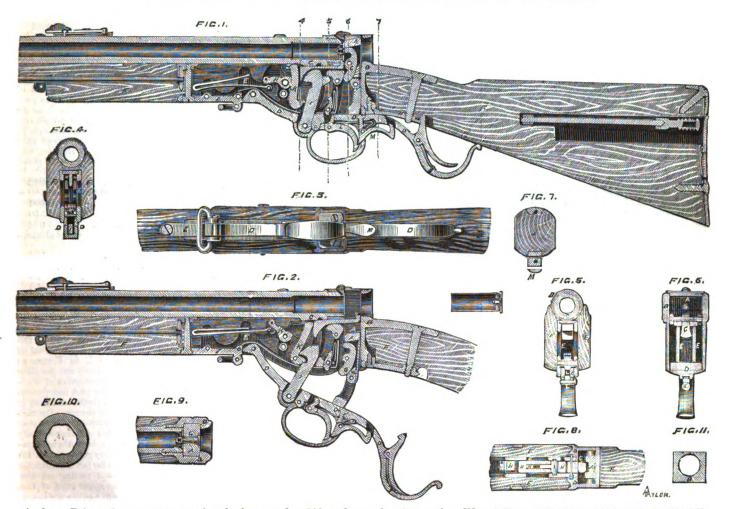
# THE SOPER BREECH-LOADING RIFLE.

N pursuance of an intention expressed some time since to give our readers particulars of such breech-loading rifles as proved themselves, by their performances or other merits, worthy of notice, we illustrate herewith another rifle of this class. It is the invention of Mr. W. Soper, of Friar-street, Reading, and its mechanism is clearly seen from our engraving. Fig. 1 is a longitudinal section of the rifle, with the parts shown in their position after the firing of a shot. Fig. 2 is a similar section, showing the position of is a similar section, showing the position of the parts at the moment of ejecting the empty cartridge case. Fig. 3 is an underside view of the lever, &c. Figs. 4, 5, 6, and 7 are vertical cross sections, looking towards the muzzle. Fig. 8 is a horizontal section show-ing the lock and breech. Fig. 9 is a hori-zontal section through the breech wedge and barrel. Fig. 10 is an enlarged vertical section of the barrel, showing the rifling; and fig. 11 is the back surface of the breech upon which the wedge bears during the explosion of the cartridge.

The breech-piece A is formed of a piece of

steel which works up and down in a vertical slot made in the breech-shoe B at the rear of the barrel C, secured to the lever D at the

# THE SOPER BREECH-LOADING RIFLE.



the lever D in such a manner as that both second at 500, and second at 800 yards. cock and breech-piece work simultaneously by means of the swivel I, which passes through the centre of the cock H. The swivel I is provided with a projection and a recess suitable for working the ejecting lever K, so that by one motion the breech is lowered, the lock is placed at full cock, and the old cartridge case is ejected sharply in rear of the firer. This portion of the mechanism is so simple and so effective that, during the trials at Woolwich, the Wimbledon competitions for 1867 and 1868, and several other public trials, in which many thousands of rounds have been fired, we are informed that not a single hitch or failure has occurred. The trigger L is mounted on the lever D, and has therefore no connection with the lock until the breech is placed in its right position for firing. reinforce or safety trigger M is also mounted on the lever D, which acts upon the trigger L in such a manner as entirely to prevent its being released until the safety trigger M is first pressed. This operation is performed by the firer gripping the rifle in the Hythelposi-

It will thus be seen that the ordinary half-cock is entirely dispensed with, the rifle, when loaded, being always in a perfectly safe condition, and, at the same time, always ready for instant action, the firer having only to press the trigger L when he has taken his aim. The performance of this wife at West. aim. The performance of this rifle at Woolwich was pronounced by the Select Committee to be, for accuracy, "good," and for rapidity it excelled every other submitted; but was rejected by them on the ground that the breech mechanism was too complicated, and, in their opinion, the safety catch was not a satisfactory substitute for the half-cock. In the competition for the Duke of Cambridge's prize at Wimbledon, last year, this rifle stood first in order of merit at 200, worthy of notice.

are informed that the highest score at 200, and the third at 800 yards, were both made by gentlemen who had never seen the rifle before going to Wimbledon. At the 200 yards' range, out of the 24 highest scores made during the meeting, Mr. Soper informs us that 10 were made with the Soper rifle, us that 10 were made with the Soper rifle, although it was only tried 16 times; 6 were made by the Henry in 50 trials; 2 by the Kerr in 29 trials; 1 by the Snider in 10 trials; 1 by the Westley Richards in 6 trials; 1 by the Cooper in 4 trials; and 3 by the Carter-Edwards in 10 trials. At the 500 yards' range, out of the 17 highest scores, 6 were made by the Soper in 9 trials; 5 with the Henry in 39 trials, and 4 with the Kerr in the Henry in 39 trials, and 4 with the Kerr in 25 trials; 1 with the Westley Richards in 6 trials; and 1 with the Carter-Edwards in 1 trial; thus showing that 16 out of 41 of the highest scores at 200 and 500 yards were made with the Soper rifle in 25 trials, in a contest where there were 265 trials and 17 different kinds of breech-loaders en-

gaged.
In November, 1867, it appears that 100 rounds were fired from this rifle in three minutes and one second, the first 40 rounds being fired in sixty seconds. The account of this trial having appeared in many of the public papers, the accuracy of the statement was doubted by many who read it. The inventor, therefore, in September, 1868, gave the public an opportunity of witnessing the extreme rapidity and certainty with which this rifle can be used, when fifty-two shots were actually fired, without a single missfire or hitch of any kind, in one minute, by Private Warwick, 1st Berks, the time being kept by Captain Stephens, 1st B.V.R., Adjutant Carter officiating as umpire. Under these circumstances, the Soper breech-loader is well

# THE APPLICATION OF SEWAGE

T the present time, local boards and other corporate authorities of our large cities and towns are upon the horns of a dilemma. It is imperative that they should find some means, or devise some method, of getting rid of their sewage. The rivers and streams—the old channels of outflow—are no longer available for this purpose. The legislature has for ever prevented the further pollution of the natural watercourses of the country. are no longer to act the part of open drains and sewers, to have their contents contaminated, and to empoison the air in their vicinity, by serving as receptacles for feecal matter and refuse of the most abominable description. What is to be done with it? is the question the bewildered authorities are asking themselves and each other. To our mind, this question admits of but one answer, and that is—apply it to the land. Although our experience in the actual application of sewage to land is limited in extent, yet we have the gratification of knowing that we are gaining fresh and reliable information every day upon this important subject. Moreover, the little that has been done is in its results of a most satisfactory and encouraging character. Therefore we repeat—apply the sewage to the land. Such has always been our view of a question which has been very carefully considered in a popular scientific brochure\* by Mr. Thomas Cargill, C.E., a copy of which is now before us. In this little work, the author details in a precise and methodical

\* "Sewage and its General Application to Grass, Cereal and Root Crops: showing the results obtained by actual experience down to the present date; with plans and sections illustrating the method of forming the ground for the different systems, and for distributing the sewage over irrigated fields." By THOMAS CARGILL, Civil Engineer, A.B.T.C.D., M.S.E. London: Robertson, Broorman, and Co., MECHANICS' MAGAZINE and Patent Office, 166, Fleet-street, E.C., 1869.

manner the various results that have attended the utilization of sewage. He demonstrates elearly that without indulging in extravagant anticipations, or allowing prejudice to run away with reason, there is every prospect of great material benefit and advantage arising from the proper treatment of the question. From past successes, limited though they be both in number and magnitude, there is a sure and reliable foundation for further operations; and Mr. Cargill asserts, and rightly, too, that there is no land so poor, so sterile, nor so exhausted, that it cannot be enriched, made fruitful, or refertilized, through the medium of sewage irrigation.

One special point upon which Mr. Cargill very judiciously insists is the fact that the farmer must call in the aid of engineering skill and ability to enable him to apply sewage with real profit to his land and his pocket. In furtherance of this view, and to indicate the absolute necessity of such a step, plans and sections are given illustrating the manner of forming the land for the purpose. glance is sufficient to assure any one that careful levels have to be taken in order to properly contour the land and ensure an equable distribution of the fertilizing fluid. As this important question becomes more fully ventilated, and more thoroughly understood in all its bearings, there is little doubt but that sewage engineering will assume a prominent position as a distinct branch of the profession. It is quite possible that the time will come when Mr. Cargill's views will be fulfilled, and we shall witness "sewage pipes laid on to the land for the use of the farmer and the agriculturist in the same manner as water and gas pipes are laid on for the supply of our cities and towns. We may add that the pamphlet is printed in a clear and readable type, and is very neatly got up, the plates being particularly striking. In view of the importance of the sewage question and the interest attaching to it at the present time, we cannot too strongly commend this little work to the notice of all interested in the matter. It presents a complete account of the reliable results that have attended the utilization of sewage, and brings the information down to the present time.

# ELECTRICITY AND TELEGRAPHY.

[ER Majesty's ship "Serpent" has commenced taking a series of deep sea soundings between Galle and Singapore, with a view to the laying of a submarine telegraph cable.

The cable for the Persian Gulf, in the "Tweed," has not yet left. The "Calcutta," after her serious accident, is to be repaired, and it is probable that she will be again on her way to Bombay-it is to be trusted this time without mishap. Measures will be immediately taken to recover the seventy miles of cable that were run out of her. To the wisdom and forethought of running this cable out, her safety was evidently due; the release of the great weight from her bows, and the natural buoyancy of the watertight tank (being thus emptied), contributed entirely to this result. There appears but little doubt of the drowning of the captain, but the safety of one boat's crew is still a matter of uncertainty.

The manufacture of the French Atlantic cable is steadily progressing at a rate of about 150 miles per week, and the coiling on board the "Great Eastern" is going on. The fitting up of the ship with the necessary cable machinery is being also proceeded with, and, when complete, she will be as nearly like the successful "Great Eastern" of 1866 as possible.

The British and Irish Magnetic Tolegraph Company have declared a dividend at the rate of 12 cent. per annum.

The British Indian Telegraph Company have already made the first step towards the energetic measures we anticipated. An order for the cable, according to the contract previously entered into,

Maintenance Company for the entire amount of cable, 3,600 nautical miles in length. The Maintenance Company are at present occupied with the manufacture of the French Atlantic cable, and on its completion the new Indian submarine line will be commenced, and be as rapidly proceeded with. There is no doubt whatever but that the line will be laid early in next year. These two orders amount to the large sum of over two millions, and will add 7,200 miles to our already extensive system of submarine cable.

A satisfactory half-yearly meeting of the Electric and International Telegraph Company has been held, and a dividend declared for the half-year of 5 per cent., and an additional dividend of 41 per cent. on account of back dividends; both of these are free from income-tax, and make the total dividend for the year 141 per cent. The remarkably healthy state of this company may be shown by the fact that their reserve fund now amounts to £136,000.

The directors inform us that the Post Office authorities have examined the company's books and plant, for the purpose of deciding the net profits for the year purchased, from July 1, 1867, to July 1, 1868. These examinations have been of a most searching and complete character, and have been regularly and systematically carried on. The value set upon the company's property by the directors has been carefully made out by professional accountants, and it is hoped that the arbitrators will soon take the matter into con-

The engineering reports are no less satisfactory, the land and submarine lines being in excellent repair. The amount expended in renewals and maintenance, by keeping the lines always in first-class condition, enables the company's system now to withstand almost any weather. Although the weather during the half-year had been very boisterous, but interruption had taken place on the land lines. Although the weather during the past but little

The engineer reports that "the English end of the older of the two Zandvoort cables has been renewed, and landed at Lowestoft, instead of at Dunwich. This alteration of route avoids a part of the sea bottom which has proved destructive to the iron sheath, and by bringing the end to a more accessible part of the coast, and to the same testing hut as the other Zandvoort cable, places it under the eye of the company's resident officer, and renders maintenance

more easy and less expensive."

Some years since, the item of maintenance of submarine cables was to have entirely disappeared from the company's accounts, but every half-year it is always to be found there, with but little varia-tion in the amount; this half-year it amounts to £2,305. This may be looked upon as the expense incurred by the usual submarine cable maintenance ship and staff, and by the repairs of the three break

On July 1, the North Lowestoft cable was broken and repaired eight days after.

On October 22, cable was damaged by an anchor, and repaired on July 27; this was done without interfering with the signalling.

On July 11, the Wexford cable was broken, and repaired on the 27th.

The extensions on land have been unimportant. A line has been erected from Inverness to Wick, and the new branches of the South-Western are being provided with telegraphs. The increased value of electricity, for purposes of signalling on railways, is shown by the erection of special signal wires between London and Bedford, on the Midland Railway, on the North Western, Great Western, and other railways.

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Miles o	f line						10,160	
Miles o	f wire						50,309	
Numbe	r of inst	rume	nts				7,899	
The ab	ove show	vs au	inc	reas	e for	the	year 186	,
of—							•	
Miles o	f line .				_	_	. 153	

The company's system now consists of-

Miles of wire 690 Number of instruments

A modification in batteries has been introduced by M. Ney. It consists of the ordinary copper and zinc elements, but placed in different solutions to the general variations of the Daniell cell. An amalgamated plate of zinc is placed in a vessel filled with a solution of chloride of ammonia; in this vessel is the porous cylinder, containing the copper plate, immersed in a solution of carbonate of copper. is contended for this battery that it is constant in action, and remains so for a length of time. It can be maintained for a great period in active operation, if the liquid ammonia be replenished; for this has been given to the Telegraph Construction and purpose, it is sufficient to drop in solid chloride of

smmonia. The natural carbonate of copperate used. It is suggested that if required for military purposes, or for any service requiring transport, or where the batteries are liable to be carried about, it is only necessary to use sand impregnated with a solution of chloride of ammonia, instead of the solution itself.

M. Joulin, who has been engaged extensively in the manufacture of gunpowder and saltpetre, has noticed the extraordinary fact that, by means of conducting rods, sufficient electricity can be obtained from pulleys, excited by the friction of straps travelling at considerable speed, as to produce electric "brushes." He considers it as an duce electric "brushes." He considers it as an element of some danger in a powder manufactory.

M. Roudet has been trying some experiments in his cyanide of potassium battery. He found that its magnetic force, as compared to a Bunsen, was as 81 to 93. The following results are also given by him:-

Bunsen			933
Chloride of potassium and chlori	hydra	ıte	
of ammonia	٠.		601
Marié-Davy			548
Daniell			384
Latimer Clark gives the following	, as t	he e	electro
notive force of batteries:-	•		
(1			100

Grove 100 98 Bunsen Marié-Davy . Daniell

The results are not strictly proportionate. A new form of battery was slightly noticed in our columns some time back as the invention of the Abbé Fortin, the principal difference being the substitution of a liquid smalgam of zinc for the ordinary amalgamated zine plate. A good deal of interest has lately been given to it in France as possessing great electrometive force and peculiar constancy. The following is a description of it: constancy. The following is a description of it:— The exterior jar having its lower part non-porous and well varnished, contains the liquid amalgam of zinc, above this it is principally porous. Contact is made with the zinc by a gutta-percha insulated wire, with its extremity bare; this end, immediately on entering the liquid amalgam, becomes amalgamated, and establishes a thoroughly good contact. Its upper end is bent round the exterior jar. The interior cell consists of a porous jar, not resting on amalgam, but supported by the upper edge of the outer vessel. Its porosity only extends to the lower half to prevent the exciting liquids mixing. The negative element in it consists of a copper plate, or a plate of lead, carbon, platinum, or any platinized metal; the exciting liquid depending upon the metal, being either sulphate of copper or salts of lead, mercury, silver, &c. The exterior vessel is charged with dilute sulphuric acid. By means of the porous portion of the outer vessel, the sulphate of zinc is eliminated. It attaches itself to the side of the vessel, and, either by filtration or efflorescence after the evaporation of the water, forms on the outside, and can be scraped off. All local action in this battery is done away with, and, although at first the extra expense of the mercury may appear a disadvantage, it is contended that by producing a more powerful and constant and a less expensive battery in action, this extra cost is counterbalanced. At present we are unaware of any practical trial being given to this form of

OTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-NOTES PLICATIONS.

PROMOTERS OF VAPOURIZATION—A NEW FACT IN THE BEHAVIOUR OF IRON—SUBSTITUTES FOR

VERY interesting communication made to the A Royal Society by Mr. C. Tomlinson mentions some facts which suggest a wide practical application. Anyone who has observed a liquid boiling in a glass vessel, will have noticed that the bubbles of vapour start from but a few points, sometimes, indeed, from only one. It is not because that spot is hotter than surrounding parts, but in most cases, a minute speck or point may be seen either in the glass itself or adhering to it, and from this the bubbles of vapour stream away. Mr. Tomlinson regards a liquid at or near its boiling point as a supersaturated solution of its own vapour; and just as in supersaturated saline solutions, the introduction of a solid nucleus starts crystallization. so in the present case, the solid nucleus serves to



start ebullition. On one condition, however, the point, or speck, or nucleus, must not be "chemically clean." Chemical cleanliness, we need hardly say, means absolute cleanliness. Many may suppose, means absolute cleanliness. Many may suppose, that when, for instance, they have washed a glass rod in water and wiped it with a clean cloth, the rod is clean. Not at all; it may be dirtier than it was before. To get it chemically clean, you must put it in strong acid, then rinse it with distilled water, then put it in ether, and finally wipe it, as we may say, with the flame of a spirit lamp. Then for a moment, you may have it clean, but only for a moment; one wave in the air and it is chemically unclean once more. Dirt, however, we know is a very useful thing when in the right place, and some things which we have to regard chemically some things which we have to regard chemically as dirty, and which indeed refuse to be made clean, are highly useful as "promoters of vapourization," an expression of Faraday's adopted by Mr. Tomlinson. Among these coke and charcoal are the most active, and the results of some experiments made for Mr. Tomlinson suggest the introduction of a bushel or two of one of them into every steam boiler. Thus when water was boiled for twenty minutes in a class flesh alone 905 grains for twenty minutes in a glass flask alone, 995 grains boiled away, but when some pieces of coke were added, 1,130 grains of water boiled away in the same time. An experiment with wood charcoal had more striking results. Water was made to distil freely from a still, and the quantity collected in fifteen minutes was weighed. Some pieces of charcoal were then added, and the distillate again collected during the fifteen minutes. From the water alone, 262 grains were collected; from the water with charcoal, 334 grains; that is, upwards of one-fourth more water was evaporated when the char-These experiments were made coal was used. under the ordinary pressure, and it is likely that the results under extraordinary pressure will be An incidental advantage will be that still better. the coke or charcoal will prevent, to a great extent the deposition of crust on the bottom of the boiler, and so prevent a waste of heat from that source.

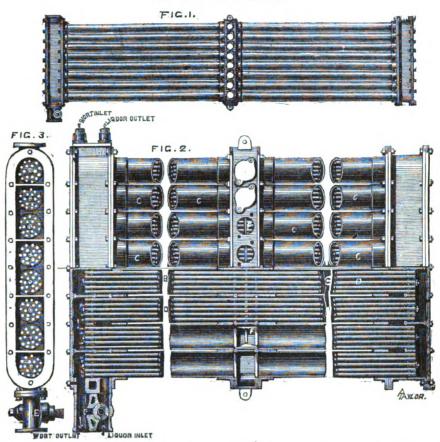
Mr. Gore has noticed a new fact in the behaviour of iron under the influence of heat and strain. A strained iron wire was heated to redness by a current of voltaic electricity, and then the current being discontinued, was allowed to cool. It was observed that there arrived a moment in the process of cooling at which the wire sud-denly elongated, and then gradually shortened, until it became perfectly cold, remaining howuntil it became perfectly cold, remaining however permanently elongated. No other metal besides iron exhibited this peculiarity, which Mr. Gore attributes to a momentary molecular change; and he points out that this change would probably happen in large masses of wrought iron, and would come into operation in various cases where those masses are subjected to the conjoint influence of heat and strain, as in various engineering operations, the destruction of buildings by fire, and other cases. The since every fact relating to iron is of importance

It is very hard in these days to hit upon an absolute novelty. Dr. Sace probably thinks he has done so, when he proposes to the French Academy of Sciences the use of tungstate of baryta in place of white lead. In fact, several tungstates were suggested for the purpose some years ago, and tungstate of lead was used to a considerable extent. Its price, however, was an years ago, and tungstate of lead was used to a considerable extent. Its price, however, was an obstacle to its general employment. All lead compounds, too, are open to the objection of becoming discoloured by the action of sulphuretted hydrogen, and the tungstate formed no exception. One difficulty with baryta is to get a tungstate which will retain a pure white colour when thoroughly dried; and, if this be exercuse, the colour does not cover well because colour when thoroughly dried; and, if this be overcome, the colour does not cover well, because of the crystalline character of the precipitated salt. Tungstate of baryta is formed by precipitating tungstate of soda with chloride of barium, and it is said to exhibit in an eminent degree the phenomena of fluorescence. If any but the monotungstate of soda be employed, the precipitate, when dried, is more or less yellow. Wolfram is now much cheaper than it used to be, and a further investigation of the tungstates as pigments might meet with some reward.

It is officially intimated that Peruvian guano has been found at thirty-five places on the main land and islands of Peru, independent of the other localities well known before. Accurate surveys are ordered, as in the case of the Maccabe, Gunape, and Lobos. One place is estimated to contain 3,000,000 tons, situated near the River Loar.

# REFRIGERATING APPARATUS.

BY MR. T. WILKINS.



BREWING PLANT AND WILKINS' MACHINERY.

INDER the above comprehensive head, we purpose to notice some fell pose to notice some of the special productions of Mr. Thomas Wilkins, of the Orchard Works, Ipswich. These works have long been renowned for the machinery turned out there, which is of a plain and unadorned, but thoroughly substantial character. We will first describe the apparatus to which our engravings refer, and then proceed to notice several other important adjuncts of the brewery. The mashing machine is Chittenden's patent, and is manufactured by Mr. Wilkins. This machine is on a new principle, and is found to be superior to other systems. It quickly and thoroughly saturates and mashes every particle of grist before falling



into the tun. It can be used while the covers are on the tun, thus preventing the loss of heat and flour. Being self-acting, it requires no motive power beyond the supply of liquor used for the mash. The operation is as follows:—When proceeding to mash, the liquor is turned on, and enters the small cylinder beneath the cone, where it comes into contact with a water-wheel contained within it. The wheel is attached to the rakes, and therefore sets them in motion. The liquor escapes down the three pipes shown in section, which are

perforated only on one side, in the same way as ordinary sponge, and is thence transmitted to the falling mait. Owing to the arrangement of liquor, all its force is utilized, and a powerful turbine is produced. The malt falling from the hopper on to the cone is thus equally spread over the machine, and is thoroughly mixed with the liquor escaping from the revolving rakes, and the mash is perfect.

We next come to Mr. Wilkins' refrigerator, which was introduced by him some thirty years since, and which has been the subject of repeated improve-ments, bringing it to a state of high efficiency. Our engravings represent a twenty barrel refrigerator, of which fig. 1 is an elevation, fig. 2 an end view with the cover removed, and fig. 3 sections of the various parts. The liquor entering the large pipe c, surrounds the small pipes b, which contain the wort, and, passing from end to end of the large pipes, successively, makes its exit almost as hot as the boiling wort enters. The wort enters at the same end of the refrigerator that the liquor escapes from and passes through the small pipes, of which there are seventeen in each of the large pipes, thus meeting the colder liquor as it cools, until it escapes within 6deg. or 7deg. of the temperature of the cold liquor. With this apparatus no coolers are required, as the wort can be admitted direct from the hop-back, using fron  $1_{\frac{1}{6}}$  to 2 barrels of liquor per barrel of wort. Referring to the details of construction, we may observe that a are discs, two of metal and one of india-rubber between them. The outside of these discs fit the insides of the pipes c, while the holes in them fit the outsides of the pipes b. A bolt, d, passes from end to end of the refrigerator, and compresses the india-rubber at each end between the discs, thus making a perfeetly tight joint between liquor and wort. At the same time the apparatus is easy of access for repairs to the small tubes. e is a two-way cock, which, when the worts are down (the cock leading to the fermenting squares being closed) is opened, and liquor pumped through the wort-ways into the hop back thus thoroughly cleansing the insides of the small pipes; f is a stay in the centre box, which supports the small tubes and keeps them apart from other. The efficiency of this refrigerator is admitted wherever it has been introduced. Some of the original ones are in the places where they were

work, and is very suitable for brewers. To twenty quarters it comes out about half the price of highly-finished engines, and works just as well. Several working of these engines of 4-horse power are of these engines of 4-norse power are working 15-quarter broweries, pumping liquor, worts, &c., mashing, grinding malt, hoisting sacks, and doing stable work besides. Mr. Wilkins has a very good stop valve, which he calls the "straightway," and which is better for use than that of ordinary form, which usually prevent the pipes being emptiod of their contents. There is no obstruction to the free flow of the passing fluid, so that pipes can be emptied without separate drain cocks, a great desideratum in breweries. The valve is regulated by a screw turned by hand wheel, which is the best method out. A three-throw pump of Mr. Wilkins is worthy of notice, as being very neat in design, and as having a very long stroke, and being design, and as naving a very long stroke, and being of great strength and durability. On the whole, having examined the make and arrangement of Mr. Wilkins' machines, we can commend them to our brewing friends, not as highly-finished examples, but as specimens of sound design and good substantial workmanship, and as bearing the stamp of utility with economy.

#### WIRE ROPE TRANSPORT SYSTEM.

A NOVEL use of wire ropes has recently been patented and put into practice by Mr. Hodgson, C.E., having for its object the construction of light and cheap ways for the transport of mineral or agricultural produce in localities as yet unprovided with railways. Though a great number of cases exist in Great Britain to which it may be applied with advantage, the chief development of this method of carriage will probably take place in the colonies, and in other countries which stand in urgent need of light lines of some kind to convey their productions to the main arteries of inland communication, or to ports. The system may briefly be defined as a continuous development of the plan now not unusual in India, Australia, and in some mining districts, of bridging over a river or ravine by a single wire rope, by which, carried in a bucket suspended by a pulley, the necessary loads are transmitted from one point to another.

To accomplish the easy passing of the points of support necessary to carry out a continuous line of communication, and to provide for the distribution of the burden and the application of motive power, have been problems of no small difficulty; but, after experiments on a first trial length of half a mile, during the autumn of last year, these practical details were worked out, and a contract was immediately entered into for a line of three miles in length at Bardon Hill quarries, belonging to Messrs. Ellis and Everard, near Leicester, which has recently been completed, for mineral traffic. The practical working of this line was tested last Saturday, in the presence of a number of ongineers and gentlemen interested in the question, when it was found to work well, and to answer its purpose admirably. This line consists of when it was found to work won, and we amount its purpose admirably. This line consists of an endless wire rope, supported on a series of pulleys carried by substantial posts, which are ordinarily about 150ft. apart, but, where necessary, much longer spans are taken, in one case amounting to nearly 600ft. This rope passes there of its ands round a Fowler's clip drum, at one of its ends round a Fowler's clip drum worked by an ordinary portable steam engine, and the rope is thus driven at a speed of from four to six miles an hour. The boxes in which the stone is carried are hung on to the rope at the loading as carried are hung on to the rope at the loading end, the attachment consisting of a pendant of peculiar shape, which maintains the load in perfect equilibrium, and at the same time enables it to pass the supporting pulleys with ease.

Each of these boxes carries 1 cwt. of stone, and the delivery is at the rate of about 200 boxes or ten tons per hour for the three mile distance. It

is almost unnecessary to observe that the proportions of such lines can be varied to any extent to suit the requirements of any particular trade, ranging from 10 tons to 1,000 tons per day.

In the case of lines for heavy traffic, where a series of loads, necessarily not less than 5 cwt. to

10 cwt. each, must be carried, a pair of stationary supporting ropes, with an endless running rope for the motive power, will be employed, but the method of supporting, and the peculiar advantage of crossing almost any nature of country with a goods line without much more engineering work

vary considerably in proportion to the quantity they are required to carry, but from their peculiar con-struction their cost will vary very slightly in relation to the nature of the ground which they may traverse.

The most important feature in Mr. Hodgson's invention is his method of passing the points of support. Both in lines like that now in operation, where the rope moves, and in those in which it is proposed to have a standing rope separate from the propeller, the stability of the load is obtained by curving in the frame of the carriage till the centre of gravity comes under the rope. The overhanging of the rope is of course ossential in this case. Nothing can be more satisfactory than the working of the present three mile line, which stamps it as a practical invention, and which we hope will lead to its adoption wherever the necessity for such an appliance exists.

## LONDON ASSOCIATION OF FOREMEN ENGINEERS.

ON Saturday last the sixteenth anniversary of the above Association was celebrated in the usual way by a dinner at the City Terminus Hotel, Cannon-street. Mr. Joshua Field, Esq., C.E., Hotel, Cannon-street. Mr. Joshua Field, Esq., C.E., occupied the chair, and Mr. R. Moreland, Esq., C.E., the vice chair. The members and guests numbered nearly 200, and amongst the company present we observed General Lefroy, R.A., F.R.S., E. J. Reed, Esq., C.B., Joseph Whitworth, Esq., LL.D., F.R.S. W. Todd, Esq., C.E., Robert Mallet, Esq., C.E., F.R.S., Frank Ives Scudamore, Esq., Henry J. Slack, Esq., F.G.S., Captain Rintoul, Edward R. Allfrey, Esq., C.E., Edward Humphrys, Esq., C.E., John Penn, jun., Esq., Charles Seidler, Esq., Jchn R. Ravenhill, Esq., C.E., James Robertson, Esq., V. Pendred, Esq., Passmore Edwards, Esq., Dr. Fennell, &c.

After the usual loyal toasts, the Chairman proposed that of the "Army, Navy, Militia, and Volunteers," which was responded to by General Lefroy, and Mr. E. J. Reed, C.B., the Chief Constructor of the Navy, Captain Monoriefi, who was also to have responded, being absent from illness. The report of the secretary, Mr. D. Walker, was then read, after which "Prosperity to the Association" was proposed by the Chairman, who coupled with the toast the nave of its indefitigable president. the toast the name of its indefatigable president, Mr. Joseph Newton. Mr. Newton, in responding, very happily referred to the relations between the foremen engineers and their employers, and pointed out the good feeling and perfect under-standing which existed between them. He also referred to the satisfactory condition of the Association, which was due in some respects to the employers as well as to the members themselves. Other toasts of a complimentary character were given, and, with musical selections, served to interest the company until about twelve o'clock, when the meeting separated, after an exceedingly

pleasant evening. Our readers and the public generally are, for the most part, well aware of the nature and objects of this Institution; but as there are always some who desire information on such matters, we think the present occasion a fitting one to say a few words explanatory of the origin and objects of the Association. It was founded in 1852 by a few zealous and intelligent foremen, who felt that the class to which they belonged occupied, intellectually and socially, an isolated and unsatisfactory position. They, therefore, at once proceeded to frame a set of rules, and to constitute themselves a socioty. They struggled on through good report and evil report for some years, and having weathered the storm, the London Association of Foremen Engineers is now in vigorous health, and exhibits no symptoms of decadence. Each year witnesses a steady accession to its list of honorary Each year and ordinary members. The first-named class comprises some of the most eminent employers of engineering labour in the metropolis, and many gentlemen distinguished for their scientific acquirements and high social position. The second are drawn from the ranks of foremen and draughtsmen connected with the various branches of the engineering trade, and who are only eligible after having occupied principal posts for the space

of two consecutive years.

The operations of the Association are conducted on two distinct bases—the one scientific and the other benevolent. It has its monthly meetings for the discussion of practical subjects, its library of

blished. The first of these has reference to the temporary assistance of unemployed members, and is maintained exclusively by the annual subscriptions of ordinary associates. The second, for the payment of a certain sum on the death of a member, is maintained from the same source. The third fund is that for partially maintaining old, decayed, and worn-out foremen, who have been members, and who are unable wholly to sustain themselves. This is known as the superannuation fund, and it is almost exclusively the creation of the employers and other honorary members of the Association.

Having glanced at the origin and objects of the Association, let us now turn to its present position, which is represented in the following extracts from the sixteenth annual report, which was read by the secretary upon the present occasion. document records a continuance of the steady progress of former years; while the established features of the Association have worked steadily and well, new ground has been opened and fresh enterprise entered upon. Ten ordinary and seven honorary members have been added during the year, and two deaths have occurred, the effective number being 104 ordinary and 67 honorary members. The income of the past year was £221 10s. 6d., whilst the expenditure was £261 14s. 9d. These figures show the expenditure to have been £40 4s. 3d in excess of the income, the effect of the severe commercial panic, which necessituted payments to a number of unemployed members. The present value of ordinary funds invested in stock Three per Cent. Consols is £364 4s. 2d.; there is in the savings bank the sum of £65, and in the treasurer's hands £4 18s. 9d., making a total of £434 2s. 11d. A widow and orphans' fund was established in the early part of the past year, which has not progressed quite so satisfactorily as could have been wished. To the superannuation fund there has wished. To the superannuation fund there has been subscribed by the various gentlemen a total of £95 14s., which, with subscriptions previously acknowledged, gives £720 18s. The interest on this sum is £51 16s. 2d., giving a grand total of £1,044 16s. 2d. We are glad to learn that this fund, with the accumulating interest, remains intact, no application having yet been made for the benefit it provides, although when applicants do come forward, the amount will go but a short way in providing for them, as the interest—the only part that will be appropriated—would suffice for but two at the rate laid down. The interest in the proceedings of the monthly meetings-of which abstracts appear in our columns—continues to increase, and they are found to improve in usefulness as the papers become more practical and less speculative; in fact, in every department of this Association there are evident tokens of advancement and steady progress, which must, by improving the intellectual and social condition of the foremen engineers, act beneficially upon the interests of the employers of engineering skilled labour.

# COILED TUBE BOILERS.

T was once thought that the perfection of boiler construction had been arrived at in boilers made on the coiled tubular system. This principle, however, soon showed a radical defect which led to its abandonment. Boilers so constructed failed on account of the tubing becoming red hot when the engine was standing, and the force pump was consequently not acting. This defect, however, has been practically overcome by Mr. Thomas Mills, of No. 2, Crescent-road, Plumstead, in the invention we are about to describe. Mr. Mills constructs the firebox of a boiler, of the upright form, of a coil of tubing enclosed in a case, the firebox being contained within the coil. The bottom of the coil is connected by a tube brought down outside the casing from the upper part of the boiler, at the lower end of which tube is fixed a self-acting valve placed in a horizontal position, which allows the water to pass on into the coil. The expansion of the water caused by its coming in contact with the heated tubing closes the valve after it has passed through it, and thereby prevents a backward flow of water through the outside tube, and forces the water and steam on through the coil into the upper part of the boiler again. After this, the valve again opens, in con-sequence of the downward force of the water in the outside tube, thereby creating a perfect circula-tion through the coil, the discharge end of the coil being brought up inside through the bottom of than is necessary for fixing an electric telegraph, without bridges, without embankments, and without masonry, exists equally in both branches of the system. The cost of establishing these lines will

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the pump being altered according to the quantity of water required to supply the boiler), and cutting off the other supply of water by means of a cock fixed in the outside tube connecting the upper part of the boiler with the lower end of the coil, thereby feeding the boiler with water through the coil without in the least degree reducing the volume of steam. This method of feeding the coil by the outside tube and valve brings the water direct into the hottest part of the coil, and keeps up a perfect and continuous circulation without the aid of the force pump. This pump is used to feed the boiler through the coil, which is a great advantage in itself, as the cold water does not come into direct contact with the steam contained in the upper part of the boiler, which causes loss of steam by condensation. Mr. Mills has made practical trials of this improved system of construction, and finds it to realize the following advantages—economy in every respect, rapid generation of steam, great strength, and almost entire freedom from explosion, together with lightness and simplicity. He states that it raises stoam from cold water in less time than any other boiler at present in use. The cir-culation through the coil being exceedingly rapid, no deposit is found to remain in it. The self-acting walve or clack is so simple in construction that it cannot fail to act.

#### ROYAL UNITED SERVICE INSTITUTION.

A T the evening meeting of the members of the above Institution, on Monday last, Admiral Sir Henry Codrington in the chair, Mr. J. M. Hyde read an able paper "On Deflecting Armourplated Ships for Coast Defence." The lecture was illustrated by two admirable models, and a series The lecture was of experiments made with model gun, shot, and targets, all alike on a scale of one inch to a foot; the model 600-pounder having thus a bore of exactly one inch, and the six, nine, and twelveinch targets being equally represented by halfinch, three-quarter-inch, and one-inch plates.

The system of plating shown in Mr. Hyde's models may be regarded as an iron glacis at a slope of 221 degrees around the entire deck; the one model having plated chambers at each end, bow and stern, the other having a plated casemate in the centre. The armour forms an overhanging knuckle all round the ship, the horizontal edge of which is the only portion facing directly the line of fire from an enemy's guns, and this portion presenting with 4in. armour-plating a depth of I8in. to the enemy's projectiles. The series of experiments with the model gun and targets were exceedingly interesting, as showing the defensive value of angulated armour, and remarkable deflections of shot with ogival heads, particularly so when a wood facing was placed in front of the iron armour, the shot in this case turning out again by ricochet without touching the plate itself. A plan for the conversion of wooden ships by the addition of Mr. Hyde's armoured sponsons was also submitted. In Mr. Hyde's system, it will be understood, the ship has no vertical wall whatever. The paper was discussed by Captain Beamish, Mr. Wilson, and other gentlemen, the chairman expressing a high opinion of the value of deflecting armour for ships of war.

## THE FOREIGN COAL AND IRON TRADES.

THE demand for coal in Belgium has somewhat improved, but the trade is still characterized by a certain hesitation, and in the basin of the Couchant de Mons the production has been reduced to one-fourth its full amount. The coalowners of the province of Namur have formed an association for the protection of their trade interests. It is calculated, but unofficially, that the total quantity of coal exported from Belgium to France last year was 3,226,378 tons, as compared with 3,014,452 tons in 1867, and 3,393,649 The quantity of coke exported from tons in 1866. Belgium to France last year was 193,131 tons, as compared with 232,984 tons in 1867, and 292,793 tons in 1866. A readjudication of a contract for 9,000 tons of rails required for the Belgian State railways will shortly be made, but the date has not yet been fixed. Some improvement is noted in pig in Belgium; refining now ranges from £2 16s. to £2 18s. per ton. Stocks of pig are stated to be generally much reduced in Belgium, while the requirements of consumption are increasing. The demand for pig is also active in the French department of the Moselle, and the French iron trade generally may be said to sustain the im-provement which has been noticed in it of late.

THE CLYDE AND NEW YORK, 1868.

THE returns of the shipping trade between the 1 Clyde ports and New York during 1868 show a marked increase of prosperity over those of the preceding years, both as regards outward and Over 1867, which was an excepinward trade. tionally prosperous year, there was an increase last year in the sailings from the Clyde of 3 vessels and 4,250 tons, but only an increase in the arrivals of 6 tons, the number of vessels being less by two than in the previous year. Over 1866, however, the increase in arrivals amounted to 18 vessels and 17,000 tons, and in sailings to 15 vessels and 16,600 tons; while over 1865 the increase in arrivals amounted to no less than 32 vessels and 42,000 tons, and in sailings to 42 vessels and 45,200 tons. The number of vessels which left the Clyde last year for New York was 73, and the tonnage 77,752, and the number which arrived 64, and the tonnage 72,058—a trade rather more than double that of four years ago. Besides this, an active trade has been carried on between the and other North American ports. Clyde arrivals there were six steamers and seven sailing ships of 7,015 tons from New Brunswick; 21 vessels, of 3,038 tons, from Newfoundland; 13 ships, of 5.418 tons, from Nova Scotia: 5 vessels of 1,054 tons, from Prince Edward Island; and 16 vessels, of 8,948 tons, from United States' ports other than New York. There sailed 34 vessels of 5,963 tons; for Newfoundland; 10, of 6,446 tons. for St. John's New Brunswick; 19, of 8,780 tons, for Nova Scotia; 10, of 4,373 tons, for Boston; and 25, of 17,378 tons, to other United States

#### THE RECENT HEAVY STORMS.

OUR readers are doubtless often struck by paragraphs in the daily graphs in the daily papers narrating the bravery of the crews of the lifeboats which are happily increasing in number every year. The frequent repetition of these tales of disaster and rescue must have convinced the least thoughtful that a large amount of noble work was being effected. But the extent is not easily realized until the aggregate sum is shown, which is only done at the meetings of the Royal National Life-boat Institution. With the view, therefore, of promoting the interests of this noble service. ask our readers to go with us through the following summary of the business transacted at the last of the Institution, which was held at its meeting house, John-street, Adelphi, London, Thomas Chapman, Esq., F.R.S., V.P., in the chair, when rewards amounting to £78 were ordered to be given to the crows of the following lifeboats of the Society for their gallant services during the late storms. The Teignmouth lifeboat "China" saved the crew of four men of the trawler "Start," of Brixham, during a gale of wind on the 5th ult. lifeboat "Albert Edward" saved the crew of six men of the brigantine "Thomas," of Poole, eight men from a small boat which had capsized in endeavouring to rescue them, and the crew of six men of the French schooner "Alexandrine," of Pornic, all of which, during a strong gale from W.N.W., with a heavy sea, were wrecked on the Doomed Bar on 15th ult. In rescuing the crew of the French schooner, the lifeboat shipped two heavy seas and lost two oars. The Southwold large sailing lifeboat had also gone off, and saved the master and three of the crew of the barque "Lord Coke," of Middlesborough, which had sunk on Sizewell Bank during squally and thick weather on the 15th ult. The Lowestoft lifeboat "Lætitia" had likewise gone off during a gale of wind and rescued the crew of eight men of the sloop "Queen of the Tyne," which was wrecked on Corton Sand, on the 29th ult. The Great Yarmouth lifeboat "Mark Lane" had put off and saved the crew of thirteen men and a pilot from the barque "Libertas," of Genoa, on the 31st ult. The Cadgwith lifeboat "Western Commercial Traveller" had also, with the assistance of two steamers, brought into Falmouth the Austrian brig "Veritas," and three French fishermen who were on board the vessel, which was in a disabled state, had been abandoned by the crew and was likely to drive on the Manacles Rocks during a gale of wind on the 29th ult. The Ramsgate lifeboat "Bradford" had also put off and rescued seven men from the schooner "Chaften Winkle," of Aalborg, which was wrecked, during a strong gale from S.E., at the back of the Goodwin Sands, on the 14th ult. The same lifeboat had also saved seven men belonging to the brig " of Rostock, on the 24th ult., making a total of sixty

given to the crews of the lifeboats of the Institution Braunton, Ballycotton, Mullion, Anstruther, Walmer, Dungeness, Thorpeness, Skegness, Mun-desley, and other places, for either assembling or putting off in reply to signals of distress, with the view of saving life from shipwreck.

The silver medal of the Institution, a copy of the ote inscribed on vellum, and £3 were voted to Mr. James Crowden, chief officer of coastguard at Muchals, N.B.; £2 to Robert Fife; and £1 each to five other men, for putting off in a coble, at much risk, and saving, in a gale of wind, four men from the schooner "Kinloss," of Aberdeen, which was wrecked off Scatraw fishing creek on the 21st ult. An effort had been previously made to communi-cate with the vessel by means of a rope, in which service Mr. Crowden received a severe contusion on the knee, being struck by a heavy sea, and dashed amongst the rocks. Various other rewards were likewise granted to the crews of different shoreboats for saving life from wrecks on our coasts. It was reported that the London coal merchants had prosented £703 10s. to the Society, to defray the cost of the Southwold large sailing lifeboat, which was hereafter to be named the "London Coal Exand that the merchants of Mincing-lane had given £1.000 to meet the whole expense of the Montrose lifeboat and its support. The ladies of Edinburgh had also, by means of a bazaar and collections, raised £1,000 towards the expense of the permanent maintenance of the "Edinburgh Workmen's" lifeboat stationed at Port Logan, N.B. A grand bazaar and fêtes are to be held at Exeter during Easter next in aid of the support of the twenty-two lifeboats on the coasts of Devon and Cornwall. Articles for sale at the bazaar are earnestly invited and will be thankfully received by the hon. secretaries at Exeter. It was decided to form a lifeboat station as soon as practicable on the Isle of Arran, N.B. Legacies amounting altogether to £600, less duty, &c., had been received from the executors of the late Mrs. and Miss Warner, of Lyncombe, Somerset. A first instalment of £100 had likewise been made to the Society on account of the legacy of the late C. W. Jones, Esq., of Norwich. The late J. S. Beckett, Esq., of Tormoham, Devon, had bequeathed £600 to for a lifeboat to be named the "Gertrude." ments amounting £1,700 were ordered to be made on various lifeboat establishments. New lifeboats had been sent during the past month to Weymouth, and to Lynmouth, North Devon. Demonstrations had taken place at each station to welcome the arrival and first launch of the lifeboats, that at Weymouth being of a most imposing character. A public meeting was recently held at Penzance, to present the rewards granted to the crews of that lifeboat and others, for their gallant services on December 6 last, in saving eight men from the wrecked barque "North Britain," of Southampton. The meeting, which was held in St. John's Hall, was one of the largest and most enthusiastic ever held in that town. A report was read from Captain D. Robertson, R.N., the Assistant-Inspector of Lifeboats to the Institution, on his recent visits to different lifeboat stations. The proceedings then

THE number of visitors to the South Kensington The number of visitors to the South Kensington Museum during the week ending February 13, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 13,380; Meyrick and other galleries, 2.305; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 1,748; Meyrick and other galleries, 240; total—17,673. Average of corresponding week in former years, 10,489. Total from opening of Museum—8,154,430.

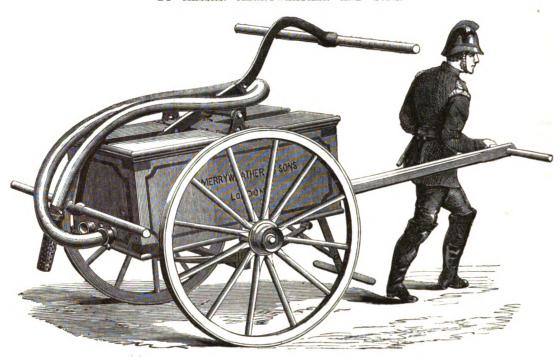
The number of visitors to the Patent Office Museum, South Kensington, for the week ending February 13, was 4,482. Total number since the opening of the Museum, free daily (May 12, 1858),

THE MANUFACTURE OF WATCHES AND CLOCKS THE MANUFACTURE OF WATCHES AND CLOCKS

A most interesting and instructive little work
describing briefly, but with great clearness, the rise
and progress of watch and clock making, has just
been published by Mr. J. W. Benson, of 25, Old
Bond-street, 99, Westbourne-grove, and the City
Steam Factory, 58 and 60, Ludgate-hill. The book,
which is profusely illustrated, gives a full description of the various kinds of watches and clocks,
with their prices and monophold racks a nucleus. with their prices, and no one should make a purchase without visiting the above establishments or consultwithout visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends this pamphlet to any address on receipt of two postsix lives saved by lifeboats during the past month age stamps, and we cannot too strongly recommend alone. Rewards amounting to £115 7s. were also it to the notice of the intending purchaser.—| ADVT. |

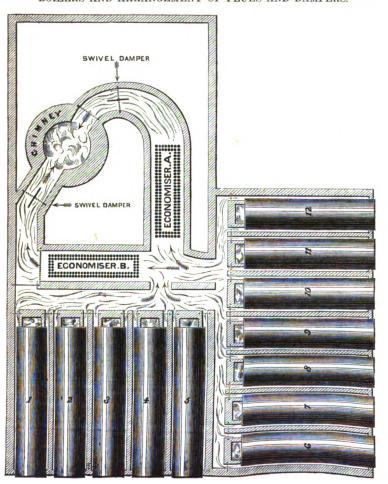
# CURRICLE FIRE ENGINE.

BY MESSRS. MERRYWEATHER AND SONS.

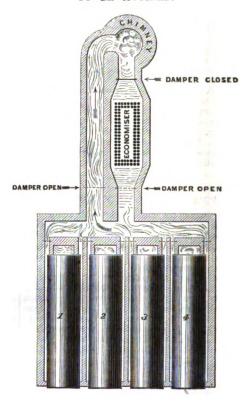


# FEED WATER HEATER EXPLOSIONS.

EPLAN SHOWING EXPLODED ECONOMIZER, WITH POSITION OF BOILERS AND ARRANGEMENT OF FLUES AND DAMPERS.



PLAN OF SHUTTING OFF ECONOMIZER TO BE AVOIDED.



N THE INFLUENCE OF THE OXIDES OF CHROMIUM AND TITANIUM
THE COMPOSITION OF PIG IRON.

THE Messrs Hayes, of 20, State-street, Boston, assayers to the State of Massachusetts, publish the following regarding the changes going on in the ore beds:—Within the last five years we have been frequently employed in chemical investigations of the altered character of some pig irons, which resulted, apparently under the usual circumstances, in the reduction of uniform ore. cases, the amount of carbon, united with iron, had been diminished, without the introduction of other matter, in quantity sufficient to influence a change in this connection, and generally no variation in the composition of the ore was known or suspected. We had analyzed the ores in some of the beds, in former years, and regarded them as well adapted to the production of pig iron of good quality; but, in pursuing the research, we were convinced that the change in quality of iron could be traced to altered composition in the ore of part of the beds used for supplying the furnaces. The correctness of this view was confirmed by our analysis of many iron ores, in some of which we found the oxides of chromium or titanium existing where they were not indicated, or connected with the ore in beds, which have been considered as pure iron ores. But the exide of chromium and the oxide of titanium seem to act in the furnace or crucible in a way to withdraw a portion of the carbon, or prevent that true union of carbon, with a portion of the iron, which constitutes grey pig iron, without the metals of these oxides really alloying with the iron, and thus indicating the cause of the change. We have analyzed samples of pig iron, where these oxides accompanied the ores in the beds, but we were not prepared to find an influence exerted on the quality of the pig metal without the refractory metals forming a part of the composition.

The occurrence of oxide of manganese with iron

ore is common, and titanium compounds are often found in both magnetic and brown iron ores as insoluble substance, in small proportions, and these compounds combine with, and are removed by, the grace without injury to the pig metal. These fluxes, without injury to the pig metal. These compounds of titanium are the cause of the often superb blue colour of the cinder, produced under varying conditions, of glassy or stony character, and must be carefully distinguished from those we regard as more detrimental in their influence on the metal. In a number of analysis of iron ores, we had found both oxide of chromium and oxide of titanium, in a state rendering them soluble in diluted acids, and in condition to escape detection in the ordinary modes of analysis. Both magnetic and brown iron ores have been found to contain either oxide of chromium or oxide of titanium in this soluble state. Among the samples from con-tiguous beds, this diversity in composition, made the presence of some oxide of chromium, or oxide of titanium existed—and while the bulk of a bed of ore was pure, continuations of the bed, or associated ore, yielded notable weights of oxide of chromium, or oxide of titanium, in the different samples. The suggestion we would make to the iron master in view of these facts is, the possibility that the quality of the pig metals, in anomalous cases, being greatly influenced by the admixture containing the oxides of chromium or of some ore titanium, with the basis ore of good quality. This may take place by the main bed being crossed by veins of mixed ore, or by the workings passing into contiguous beds, where one kind of ore is used. In other cases, where the iron master can gain the greater advantage arising from mixing ores the kinds may contain contaminating oxides, and injure the iron. The following are some results of analyses, showing the proportions of oxide of chromium to the metallic iron contained in the ores :- 1st. Magnetic ore.-Iron, 49; oxide chromium, 1.40. 2nd. hematite ore.—Iron, 42.47 oxide of chromium, 1-60. 3rd. Brown ore.—Iron, 54-32; oxide of chromium, 1-90. 3rd. Brown massive —Iron, 46.70; oxide of chromium, 1-04. Mere traces have been discovered in some cases, while in other instances a larger proportion of chromium formed an alloy with the iron produced from the ore

# CURRICLE FIRE ENGINE.

THE accompanying illustration shows an improved curricle fire engine made by Messrs.

Merryweather and Sons, of London. These engines have each a pair of gun-metal pumps, 4in. diameter, with 9in. stroke of pistons, and, when pumped by six men, are capable of discharging sixty gallons per minute to a distance of 80ft.

The pistons, valves, and seatings are also of gun motal, fitted into a chamber, wherein they are most easy of access. The air vessel is of copper, whilst the frames, working levers, axle, &c., are of wrought iron. The works are mounted in a strong oak cistern, which may be supplied with water by means of buckets, when the engine is not working through its suction pipe. This cistorn has a pair of covers, and the hose is preserved there. The suction hose, as will be noticed upon referring to the illustration, is always affixed to the suction screw of the engine, so that, by the unbuckling of a single strap, and connecting a delivery hose, the engine may be put into action in a few seconds. Being mounted on high wheels, it is easily and rapidly drawn by one man through The cost of an engine of this class is the streets. The cost of an engine of this class is considerably lower than that of the ordinary fire engine, whilst, at the same time, it is equally efficient. Many of them are in use in Spain. They are also adopted by the Metropolitan Fire Brigade, as also in country villages, and the mansions of the nobility and gentry.

#### FEED WATER HEATER EXPLOSIONS.

REED water heaters, or fuel economizers, have for some time past, been in extensive use, and until quite recently they have always been considered as absolutely safe. It has been thought that the failure of one pipe could not possibly lead to the failure of others, but that the pressure would be eased off and explosion rendered im-possible; that, in fact, a cracked pipe would only be a safety valve. This opinion is generally enter-tained with regard to the various tubular boilers now before the public, and so far there has been no reason to question that opinion as regards the boilers. But the explosion of a feed water heater some twelve months since, at Blackburn, of another at Preston, in October, last year, and of a third at Lille, still later, by which three persons were killed, renders the subject of safety in this form of construction one of considerable importance The occurrences to which we have alluded indiannex the report of Mr. L. E. Fletcher (the Chief Engineer of the Manchester Boiler Association) upon the Preston explosion. This occurrence was attributed to the accumulation of coal gas in the flues, and in order to thoroughly sift the matter, Mr. Fletcher made two visits to the scene of the explosion. On the second visit, Mr. Fletcher was as an analytical chemist is well known to our readers. The result of Dr. Smith's investigations are embodied in Mr. Fletcher's report which runs

This explosion, by which fortunately no one was either killed or seriously injured, occurred to a feed-water heater at a cotton mill, at about seven o'clock on the morning of Friday, October 16. The feed-water water heater at a cotton mill, at about seven o'clock on the morning of Friday, October 16. The feed-water heater or economizer was of the description very generally employed in this locality. It was placed in the main flue between the boilers and the chimney, so as to utilize the waste heat passing off with the gases. It consisted of about 240 vertical castiron pipes arranged in thirty rows of eight each. The length of these pipes was 10ft., their internal diameter 4in., and the thickness of metal three-eighths of an inch. The economizer was fitted with a 3-inch safety valve, while the blowing-off pressure of the boilers to which it was connected was between

601b. and 651b.
This was not the only feed heater on the works. This was not the only feed heater on the works. There were two series of boilers connected to the same chimney, and two economizers, the relative position and arrangement of which will be better understood on reference to the accompanying engraving, in which the exploded economizer is marked A, and the other one B. It is important to observe that the flues for each economizer were not distinct one from the other, but so arranged that both economizers were open to both series of boilers, so that the gases were at liberty to pass entirely that the gases were at liberty to pass entirely through one economizer or entirely through the other, or through both combined. This is a point which must not be overlooked in this investigation.

On the occurrence of the explosion, the economizer

On the occurrence of the explosion, the economizer was torn from its seat and broken into hundreds of pieces, which were scattered to various distances of about 30 ft. or 40 ft. At the same time, the firedoors of all the boilers but No. 6, which was the most distant from the economizer, were violently blown open, and one of the stokers burnt by the flames leaping out upon him, while another man, who was firing No. 4 boiler, started backwards ou finding the flames burst out, but before he had retreated many feet, was blown back on to the coal heap behind him. Besides this, the boiler-house roof was considerably damaged, the side of the engine-house blown down, and the brickwork surengine-house blown down, and the brickwork sur-

rounding the economizer levelled to the ground, while the main flue to the chimney was ripped open, the crown of some of the other flues lifted, one of the boilers moved slightly forward, just sufficiently so to break the steam pipe joint, and the brickwork covering on the top of the boilers marked Nos. 1, 2, 3, 4, 5 loosened, either by shock or other consequence of the explosion, in addition to which many panes of glass in the mill were broken, and a window of one of the upper storeys bulged outward. Altogether, considerable havoc was done, and regarding the amount of masonry dislodged, and the shower of cast-iron pipes and broken fragments that must have fallen, it is surprising that no lives were lost.

With regard to the cause of the disaster, it has been attributed rather to the explosion of coal gas, accumulated in one of the flues, than to the bursting of the economizer from internal pressure. This rounding the economizer levelled to the ground,

of the economizer from internal pressure. This question is one of considerable interest, and on which a good deal of discussion has arisen. Those question is one of considerable interest, and on which a good deal of discussion has arisen. Those who attribute the disaster to the explosion of coalgas, conclude that in consequence of the current through the economizer being checked by the closing of the damper between it and the chimney, an accumulation of gas thrown off from the fires took place within the flue, the gas being either carbonic oxide, or carburetted hydrogen, or possibly a mixture of the two, which, combined with air admitted through the furnace doors, or passed unconsumed through the bars, which is always the case to a great extent, would form a very explosive compound, needing only to be ignited by a red hot spark to cause an explosion. It will be seen on consulting the plan that the furnaces inNo. 4 boiler, which the man previously referred to was in the act of firing at the moment of explosion, and from which he was blown, were situated precisely in line with the chamber of the shattered economizer, so that it is thought that his stirring up the fires kindled the spark which led to the explosion, and thus that the train of argument is complete. Parties engaged in the construction of these economizers say that this view is supported by experience, and that other cases of explosion from the ignition of coal gas have come under their notice, though by no means so violent or destructive as the present one.

On visiting the scene of the catastrophe a few days after the explosion had occurred, when the bewilderment consequent upon it had somewhat died away, and there had been time to correct mistaken impressions and conflicting statements, I gathered that the following were the circumstances

taken impressions and conflicting statements, I gathered that the following were the circumstances

gathered that the following were the circumstances under which the explosion occurred, a consideration of which may be of assistance in determining whether the explosion was one of coal gas or steam. It appears that on the afternoon of Thursday, which was the day preceding the explosion, a leak was found to have sprung in one of the economizers, which prevented the proper water level being maintained in the boilers. As it was not known which which prevented the proper water level being maintained in the boilers. As it was not known which of the economizers was at fault, both of them were shut off, the valves or taps between them and the feed pump, as well as those between them and the boilers, being closed, so that each economizer became completely isolated. Neither of the dampers between the economizer and the chimney were lowered, but the gases allowed to pass through the economizers just as before. In addition to the ordinary dampers, there was a swivel damper between each economizer and the chimney, which was operated upon by the pressure of steam in the boilers, and closed when the steam rose to blowing-off point, so as to prevent unnecessary waste. At the moment of explosion, the steam pressure was very near to blowing-off point, so that as the swivel damper in the flue of the exploded economizer worked more freely than the other, it is not improbable that it the flue of the exploded economizer worked more freely than the other, it is not improbable that it was closed, or nearly so, at the time, and thus that the chamber of the exploded economizer was rendered almost a sealed one, as previously supposed, while the current passed through the other. To prevent an accumulation of internal pressure under the extraordinary circumstances of keeping the economizers bottled up while all the fires were hard at work, the lever of the safety valve on each economizer was raised and blocked up with a bolt, in order that they might be worked on at atmospheric pressure only. The levers of the safety valves were found to be blocked up in this way after the explosion had occurred, while those in charge stated they had seen steam escaping through charge stated they had seen steam escaping through the valves but a short time before the explosion, so that they must have been free.

so that they must have been free.

To put the matter beyond all doubt, however, I thought it best to have the cover of both safety valve boxes removed, and, on doing this, found that the levers and spindles could be lifted without stirring the valves, since they were altogether disconnected, while, although the valve itself on the economizer that had not exploded was perfectly free, that on the other was firmly locked in its soal by a coal of incrustation, and required several smart. by a coat of incrustation, and required several smart blows on its under side from a hammer to liberate it. As there was no connection between the two econo-

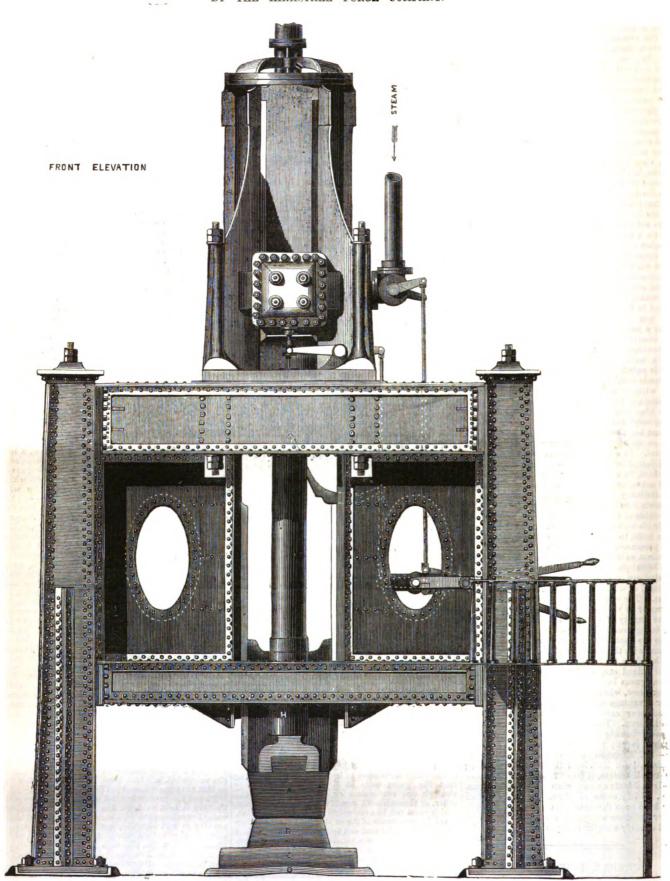
(Continued on page 140.)

<sup>\*</sup> Dr. R. Angus Smith, in experimenting on the gases passing off from several large chimneys, found that much more free oxygen passed of to waste than was consumed in the furnaces.



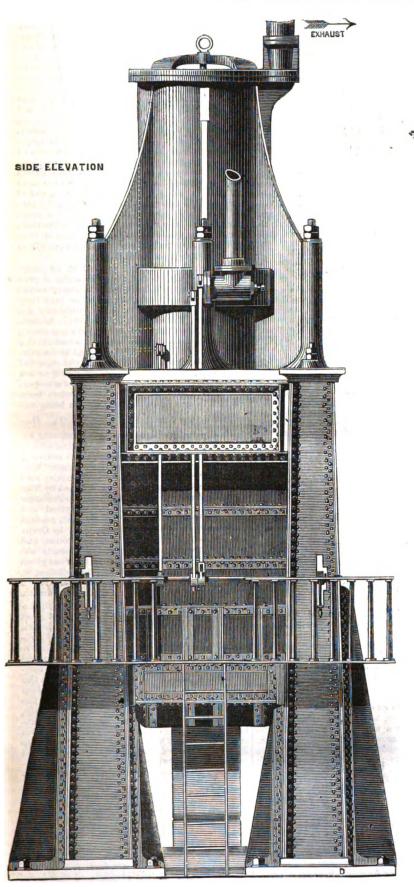
# STEAM HAMMER FOR THE RUSSIAN GOVERNMENT.

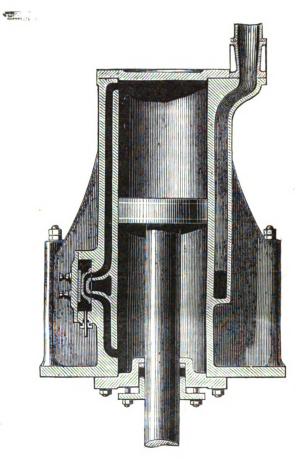
BY THE KIRKSTALL FORGE COMPANY.



# STEAM HAMMER FOR THE RUSSIAN GOVERNMENT.

BY THE KIRKSTALL FORGE COMPANY.





# STEAM HAMMER FOR THE RUSSIAN GOVERNMENT.

THE accompanying engravings represent a 50-ton double-action steam hammer, which has been constructed by the Kirkstall Forge Company, Leeds, to the order of the Russian Government. This hammer, as will be seen, is, with the exception of the cylinder, constructed entirely of wrought iron. The valve gear is so arranged that the hammer can be driven at either side. Steam is admitted to the cylinder by an equilibrium slide valve, a conical valve, as shown in our engraving, being fitted into the upper passage, admitting either the exhaust steam from the under side of the piston, or the full pressure from the boiler to the top side when required, so that the hammer may either fall by its own gravity with the pressure of exhaust from the underside of piston added, or the blow is increased by the admission of full steam from the boilers. The piston and rod are forged in one piece, which, together with the hammer, weigh 15 tons. The cylinder is 46½ in. diameter and 8ft. stroke.

(Continued from page 137.)

mizers, the idea, therefore, that it was impossible mizers, the idea, therefore, that it was impossible for there to be any pressure above the atmosphere within the exploded one, was quite a mistake, and, instead of this, there may have been one of some 5001b or 6001b, from the temperature of the gases in the flue. It should be borne in mind that as the explosion occurred at seven o'clock in the morning, it took place just when there would have been time for the economizer to be thoroughly heated up, so that these circumstances would at once have accounted for the explosion had the rents and flight of the fragments been such as appeared due to internal pressure. Internal pressure, however, will, under ordinary circumstances, burst a cylinder open longitudinally, since the tendency to rend in that direction is precisely double that to rend in the other, whatever may be the diameter of the cylinder or pressure of steam. On examining the fractured pipes, however, none could be discovered that had rent longitudinally, but all that could be seen had rent longitudinally, but all that could be seen had been broken off transversely about midway in their length, as if from an external blow rather than from internal pressure. Added to this, all the fragments were lifted from their original seat, whereas internal pressure, while it would have blown the upper portion into the air, would have tended to drive the lower one into the ground. Thus, the general development of the explosion scarcely appeared to confirm the view that the economizer had burst confirm the view that the economizer had burst from internal pressure, though it is difficult to predicate minutely what the order of results would be in a series of cast-iron pipes in the event of a rupture from some 500lb. or 600lb. internal steam pressure. It is stated, however, that boilers of very similar construction, consisting of a number of castiron pipes, have been severely fired with the safety valve locked down for the purpose of experiment, when it has been found that only one of the pipes has burst, which has let off the pressure, so that no explosion could be produced.

Under these circumstances, I thought it advisable

Under these circumstances, I thought it advisable to consult Dr. R. Angus Smith, F.R.S., F.C.S., &c., on the chemical view of the subject, and to take his opinion upon the possibility of an explosion occurring from coal gas under the special circumstances of the case, and also of its effecting the destruction of property that occurred. With this view I paid a second visit to the scene of the explosion, in company with Dr. Smith. After making an examination of the ruins, Dr. Smith came to the conclusion that both the explosion and its results were possible from the ignition of coal gas accumulated in the flues, but it may be well to give the following extract from a communication received from him on the subject. Dr. Smith says:—"Explosive gases are formed by Dr. Smith says:—" Explosive gases are formed by simply mixing gases and vapo rs from coal with air. simply mixing cases and vapor is from coas with as Indeed, every fire is making gases which explode when heated with air, so that the question arises why are we not blown up daily? The answer is because the currents of air are so constant, penetrating, and intrusive that they follow the gases, and trating, and intrusive that they follow the gases, and thus a constant and steady fire is the consequence, instead of a hasty and violent one. Every furnace, however, especially if a large one, becomes to some extent a gas retort, and generates exactly the same products, though burning them more or less. Stop the draught and gas is made. Let air enter and an explosive mixture is formed at once. Thus there is no difficulty in accounting for the given. there is no difficulty in accounting for the circumstances under examination by an explosion of gas. The long furnaces, with the impeded drught and hot The long turnaces, with the impeace aright and not flue, were capable of forming gases abundantly powerful to produce all the effects developed by the explosion under consideration. In support of this I may mention that, a short time since, I happened to enter works a day or two after the occurrence of two explosions, which could be accounted for in no other way than that just mentioned. The wonder rather is that such explosions occur so seldom."

Notwithstanding that it may be quite possible that the explosion arose from the ignition of coal gas, it scarcely appears to admit of demonstration that it actually took place from this cause. If it did, it may be asked, why had not the catastrophe occurred long before, as the swivel dampers had been at work for months, constantly opening and closing as the steam rose and fell, and there was nothing unusual in the condition of the flues excepting that unusual in the condition of the flues excepting that they were flooded with about a foot of water, which had escaped from the economizer? Besides this, the fact that the safety valve was free in the economizer that did not explode and locked fast in the one that did, while the explosion occurred at seven o'clock in the morning, just an hour after starting, when the economizer would have had time to be well heated up, and an internal pressure accumulated, are strong arguments in favour of the explosion are strong arguments in favour of the explosion being due to steam pressure. Thus there appears to be considerable probability in favour of both views. though scarcely sufficient evidence to decide posi-tively on either one, and to justify a decided opinion

as to whether the explosion arose from coal gas or

internal steam pressure.

The object of these inquiries, however, is to show how to avoid similar disasters in future, and it is thought that this end will be attained by pointing out such precautions to be adopted in the construcout such presentions to be supplied in the construc-tion and management of these economizers as will guard against their explosion either by coal gas on the one hand, or by steam pressure on the other; and with this view the two following recommenda-

and with this view the two following recommenda-tions are given:—
To prevent the explosion of economizers from internal pressure, they should be fitted with a thoroughly reliable safety valve, not liable to de-rangement by incrustation. No valves would be more suitable than those of external dead weight pendulous construction, which are made without levers, fangs, or spindles to jam fast, and instead of being boxed in out of sight, are entirely open to view. Valves of this description are in very general use on steam boilers, and hundreds of them, under use on steam boilers, and hundreds of them, under the inspection of this Association, have been satis-

the inspection of this Association, have been satisfactorily at work for years, so that their adoption may be confidently recommended.

To prevent explosions from coal gas, there should be no chambers in which the gas can lurk. The arrangement in the present instance was eminently peculiar, and most conveniently contrived for courting an accumulation of gas, so that it would be advisable to convert the two economizers into one, and have but one absorber instead of two. and have but one chamber instead of two. In some instances the ordinary reserve flue might become a source of danger if closed by a damper near to the chimney, but this would be area. damper at its entrance, so that there may be no void chamber in which the gases may accumulate. For the same reason, when the reserve flue is in use, the economizer should be cut off by a damper at the

entrance, and not at the chimney.

This will be more readily understood on a consul tation of the accompanying engraving, in which the reserve flue is shown in full work, and the economizer stopped off, with the damper between it and the Chimney closed, and the one at the entrance opened. Under these circumstances there will be little or no current through the chamber, and thus an accumula-tion of gas might settle in it and become ignited by sparks from boilers Nos. 2 and 3, which are directly sparks from boilers Nos. 2 and 3, which are directly opposite to it, very much as in the case of the explosion just reported above. It will be seen that the danger of this would be averted by closing the damper at the entrance to the chamber of the economizer, and also that the damper in the reserve flue is in a much better position close to the boilers than at the chimney. It will be well for those using econo-mizers to overhaul their arrangements and see that they do not admit of such combinations as those illustrated in this plan, and, if necessary, to have their dampers altered accordingly. If these simple precautions are adopted, it is thought that well-made feed water heaters or economizers can be worked on in safety, and that the confidence so long reposed in them may be restored.

L. E. FLETCHER Chief Engineer.

EXPLOSIVE COMPOUNDS FOR ENGINEER ING PURPOSES.

> BY MR. PERRY F. NURSEY. (Continued from page 122.)

second of the two principal opponents which gunpowder has to contend with is guncotton. This proposed substitute was discovered by Schönbein in 1846, since which time it has been greatly improved as far as regards manufacture. and attempts have been made in various countries to apply the material to purposes for which gunpowder hitherto had been alone used. In England its manufacture on a large scale was commenced by Messrs. Hall, the gunpowder makers, at Faversham. An explosion, however, soon occurred at the works, killing a number of men, the cause being the spontaneous ignition of gun-cotton. This led to the abandonment of the manufacture on a large scale, and gun-cotton was apparently lost sight of until 1854, when Hadow published some results of his investigations into the nature of gun-cotton. In France, gun-cotton was made the subject of experiment as early as 1846, and its manufacture was carried on at the Government Powder Works at Bouchet, near Paris. Here, however, disastrous explosions also occurred-one in March, 1847, and two in 1848, several lives being lost. These disasters appear to have put an end until quite recently to experiments with guncotton in France. In Austria, where great attontion has been paid to gun-cotton, Baron Von Lenk was commissioned to inquire into the merits of the material, and a manufactory of gun-cotton was established at the Castle of Hirtenburg, near Vienna. The material was applied for a while to cannon, but soon grew into disfavour, owing to its

occurred in a magazine at Simmoring, Vienna, which caused the use of gun-cotton in artillery to be put a stop to; and in December, 1866, by order of the emperor, the use of guncotton by the Austrian artillery and corps of exgineers was entirely prohibited.

Important progress has, however, been made in the development and practical application of guncotton by Professor Abel and others since its study was resumed in this country about six years ago. Very considerable quantities of the material have been manufactured at the works of Messrs. Prentice, at Stowmarket, and at the Government Gun-powder Works at Waltham Abbey; its employment as a blasting agent is steadily increasing in several important English mining districts; and some success has attended the employment of guncotton cartridges for sporting purposes. system of manufacture of gun-cotton, as perfected by Baron von Lenk, has undergone but trilling modifications in its employment in this country. It has been made the subject of careful investiga-tion by Professor Abel, and the results furnished by many experimental manufacturing operations, and an examination of the products, have shown that the process of converting cotton into the most explosive form of pyroxilin or gun-cotton, and of purifying the material, have been so greatly perfected by Baron von Lenk as to render a strict adherence to his simple and precise instructions alone necessary to ensure the preparation of very uniform products, which are much more pure than those obtained in earlier days.

Although the conclusions arrived at by many chemists who investigated the composition of guncotton, soon after Schonbein's discovery, varied very considerably, the constitution has been very generally regarded as definitely established by the researches of Hadow, published in 1854. According to that chemist, the most explosive gun-cotton has the composition expressed by the formula C . H<sub>7</sub> N<sub>3</sub> O<sub>11</sub> (which was first assigned to the substance by W. Crum, in 1847), and may be regarded as cellulose, in which three atoms of hydrogen are replaced by three molecules of peroxide of nitrogen.
The name Tri-nitro-cellulose has therefore been assigned to gun-cotton, its constitution being expressed by the formula C a  $\left\{\begin{array}{cc} H & 7 \\ 3 & N & O \end{array}\right\}$  O s. Hadow's conclusions have since been confirmed by other chemists, more especially by Redtenbacher, Schrötter, and Schneider, who have analyzed specimens of gun-cotton prepared under Von Lenk's directions. An experimental inquiry into the composition of gun-cotton, as obtained by Von Lenk's process, has been instituted by Professor Abel; and the very numerous analytical and synthetical results which he has obtained, confirm the correctness of the formula assigned by Crum and Hadow to the most explosive gun-cotton, and demonstrate satisfactorily that the products obtained by following strictly the instructions given by Von Lenk, are invariably tri-nitro-cellulose, in a condition as nearly approaching purity as a manufacturing operation can be expected to furnish.

Professor Abel has identified himself with the advancement of the gnn-cotton question, and great credit is due to him for the light he has thrown upon that question by long and patient experimental research. Still greater credit is due to him for having discovered and perfected a method of treating gun-cotton whereby it is rendered nonexplosive when burnt in the air, but in which the full energy is developed when fired in a close chamber. The method consists in reducing the gun-cotton fibre to a fine state of division or pulp, as in the process of paper making, and in convert-ing this pulp into solid masses of any suitable form or density under a pressure of 18 tons to the square inch. This method of manufacture is now carried out by Messrs. Prentice at their works at Stowmarket. To the pulping mainly is due the safety attained, as it ensures uniformity in washing, whereby the cotton is thoroughly freed from all acid, and thus every chance of spontaneous com-bustion is removed. The compression causes combustion to proceed slowly in the open air, owing to the condensed condition of the fibres, which, in the lose state of cotton or rope, burn very rapidly. The gun-cotton is made into small cylindrical charges, which are both portable and convenient for use. The principle of thus combining safety with force in a highly condensed form has produced very valuable results. A series of severe trials, extending over a considerable period, have proved gun-cotton, in its present improved form, to possess all the attributes which should be found in a material for blasting purposes. uncertainty of action. In 1862 an explosion These trials were carried out by Mr. Prontice with



<sup>\*</sup> From these remarks of Dr. Smith it would appear that there is danger from irregular and intermittent currents in furnace flues, since where they exist gas may be liberated at one time and air mixed with it at another, and thus an explosive mixture formed, so that the effect of the intermittent action of lively swived dampers upon leases but fless is a noint worthy of investigation. large hot fires is a point worthy of investigation

the view of satisfying railway companies of the absolute safety of the material. Mr. J. Wilson, the absolute safety of the material Mr. J. Wilson, the goods manager of the North-Eastern Railway, directed these experiments, and made a report thereon, from which document the author obtains

the following particulars:—
First, a small box containing 125 charges of the gun-cotton, and said to be equal in effect as a blasting agent to a quarter cask of gunpowder, When the flame reached was ignited by a fuse. the gun-cotton, there was a great blaze like the burning of a heap of loose straw, but no explosion. In less than half a minute there was no flame, except from the burning of the brown paper in which the gun-cotton had been packed inside the box. The box was of wood about \(\frac{1}{2}\)in. thick, and was nailed, but not bound with iron at the corners; it was one of the ordinary packages used for sending the cotton out. After this, a number of charges were laid on the rails near the coal depôts, and coal waggons were run over them, when some of them were ignited, others were not. Some charges were then placed so that an engine should pass over them, and they were all ignited. Mr. Prentice took an axe and chopped one charge into several pieces; there was no explosion or ignition. Small pieces of gun-cotton placed on the iron rim of a wheel and sharply struck with a hammer, exploded, or, rather, detonated. In all the cases where ignition was produced by concussion, whether of a hammer on iron, or of the wheels of an engine or waggon on the rails, it was very evident that only so much as was actually struck exploded or detonated, the part not struck firing from the explosion, and burning like straw or flax. In order to make sure that he was really dealing with the article which produces such an effect when exploded in close confinement, Mr. Wilsonhad a hole bored in a large block of hard tough wood, in which he placed a charge of gun-cotton with a fuse attached to it. He then filled up the hole with broken slate tightly rammed, and fired the fuse. When the gun-cotton exploded, the block of wood was shivered to pieces, and the fragments were blown several yards away. The result of these experiments convinced Mr. Wilson that railway companies might safely carry guncotton along with other goods in ordinary waggons, adopting the same rules as apply to the conveyance of cartridges. The North-Eastern Company acting on Mr. Wilson's recommendation, now carry The North-Eastern Company, the gun-cotton as ordinary goods in covered

waggons.

Whilst upon the question of gun-cotton transport, it may be interesting to notice a report of Colonel Boxer upon the comparative risks of guncotton and gunpowder in conveyance. The colonel is of opinion that no greater risk of an explosion cotton charges by railway or other modes of conveyance than is incurred by the transport of ordinary gunpowder. ordinary gunpowder. He further states that in the event of an accidental explosion of these charges, the amount of damage to life and property would not be greater than that which would result from the explosion of the same bulk of ordinary gunpowder. Finally, he thinks that the mode of packing the charges in deal boxes is preferable to that of packing in strong iron cylinders. The expressions with reference to the comparative in accidental explosion are, of guarded; but the author feels assured, from comparative trials made by himself on a small scale, that the damage would be much less with cotton than with powder. He has found the compressed gun-cotton perfectly inexplosive so long as the atmosphere has access to it.

The most recent feature in the development of the gun-cotton question is the rendering of the safety gun-cotton, just referred to, violently explosive when in the open air. This is effected by means of a detonating tube attached to a fuse, similarly to the method adopted by Mr. Nobel to explode dynamite. This safety gun-cotton, there-fore, which will only burn in the open air if ignited by any ordinary means, will, it appears, develope all its deadly energy if fired under the same unconfined conditions, but with a special detonating fuse. In proof of this, some experiments were recently carried out at Stowmarket by Messrs. Prentice. The author appends a few particulars of these trials, which he correct, although he was not present at the time. The first experiment consisted in placing a disc of gun-cotton, weighing about 11b. 1oz., on the stump of a tree lately felled, and igniting it by an ordinary piece of miner's fuse. At the instant of ignition it was enveloped in flame, and moved about for the two or three seconds required for its combustion. About half the quantity was then

placed on the same spot, and ignited by a small detonating fuse. A sharp, sudden report was heard, and the stump was found on inspection to be partly penetrated just where the charge had lain, while the twigs of the hedge close by suffered severely. The root of a large tree which lay on the ground was then attacked. A disc of gun-cotton, weighing about 1lb. loz., was placed in a hollow beneath it, a detonating fuse being inserted. The explosion shattered the old stump, and scattered its fragments in all directions. The next experiment was calculated to prove the question from a military point of view. A row of palisades, composed of trunks of trees, some 18in. in diameter, and all sunk 4ft. into the ground, was provided. A long tree trunk lay touching the foot of the palisade, and upon this 51b. of guncotton was laid. Wires communicating with a magnetic apparatus were affixed to a detonating tube, which was placed in contact with one of the discs of gun-cotton. Upon the explosion only one trunk was seen to fly away from the spot, and that proved to be the one upon which the charge had been placed; the palisades, although shaken, were comparatively unharmed. A charge of 15lb. of gun-cotton was then placed against another part of the stockade, which was perfectly sound, and fired. The result was a general smash up, and a tumble over of all the trunks in numerous pieces; and so it ought to have been, with such a charge as was employed.

Having brought the history of modern explosive compounds down to the very latest period—for the series of experiments last described only took place on the 22nd of last month—it will be as well, in conclusion, briefly to glance at their comparative merits. Bearing in mind the rule laid down in the opening part of the paper, that a per-fect blasting material must be safe to handle and powerful in use, we may dismiss from our minds all those substitutes for gunpowder in which the dangerous chlorates and nitrates occur. author cannot even make Reveley's white gunpowder an exception, although Mr. Reveley has long made and used it himself with safety. But this is a very different thing to the manufacture, transport, and use by rough hands of hundreds of tons a year. Neumeyer's safety powder appears to embody all that is required as regards safety and strength, although its power falls far short of that possessed by either dynamite or gun-cotton. But as this powder has not been commercially introduced into England, and, in fact, is hardly known beyond the scientific world, it cannot be quoted as a material of which engineers can make choice for blasting purposes. Next in order, we have nitro-glycerine in its improved condition of dynamite. It is between this substance and compressed gun-cotton that the contest appears to lie, and they are both such excellent materials that the probability is they will both succeed in superblasting operations. Dynaseding gunpowder in mite has superior difficulties to surmount than those which have attended the development of gun-cotton. The dangerous character of nitroglycerine has so impressed itself upon the public mind, that it will require time to remove those impressions, and to establish confidence in the safe material-dynamite. If we compare the relative safety of dynamite and gun-cotton, there appears to be no difference between them. The only doubt upon the author's mind is whether, after long storage, any dangerous change may take place in either of the two substances. Mr. Nobel has endeavoured to answer this question with regard to dynamite, but the author thinks a year is scarcely sufficient time to determine this matter in such a comparatively recent discovery. So, too, with regard to the compressed gun-cotton. The author thinks a longor time must elapse before the new form of gun-cotton can be pro-nounced absolutely safe. The old gun-cotton was supposed to be safe in storage, but accidents at home and abroad have shown the contrary; and, however Professor Abel may now have eliminated the element of danger, as far as chemistry can, it is not for any one to say it is a reliable material until such time-tests have been applied as shall satisfy not only chemical science, but common sense. It is to practical common sense that all these matters ultimately address themselves, and it would be of no avail, commercially, if all the leading chemists in Europe were to pronounce a substance safe if they could not support their opinions by experiments which the public could understand, and in which, therefore, they would place faith. With regard to the question of the

It would appear, however, to the author that dynamite was actually the stronger of the two, for, from his experience of that thinks that much less than 5lb. of dynamite would have effected what 5lb. of gun-cotton failed to do at the palisade experiments—viz., to demolish it. But this is a question that can best be settled by comparative experiments, which the author suggests should be carried out with that view.

It, therefore, results that dynamite and compressed gun-cotton equally fulfil the conditions required of a safe and efficient blasting material as far as science at present can determine, whilst dynamite appears to possess the superior shattering power. It should also be borne in mind that a bore hole will take up nearly double as much dynamite as compressed gun-cotton, as the dynamite is like moist sand, and can be packed into the irregularities of the hole, whilst gun-cotton is in cylindrical pellets, which can only occupy their own diameter in the hole. Hence, if dynamite was even inferior in point of power, weight for weight, in its application to blasting, it would be preferable. The author does not agree with the theory that the power of gun-cotton is increased by firing it with a percussion fuse. He can only conceive the fuse to act upon the gun-cotton in the way that a whip does upon a horse; it accelerates its action, but does not increase its strength. He thinks that the same explosive power would be developed in compressed gun-cotton when fired by an ordinary fuse in a confined space, as when fired by a percussion fuse under the same conditions, although it has been demonstrated that the percussion fuse will develope the energy of the guncotton in the open air, under which condition the ordinary fuse will certainly not explode, but will only ignite it.

Such, then, is the present practical position of explosive compounds with regard to engineering The most deadly explosives are at hand ready for work, but as harmless for mischief as so much sawdust or paper. They may be transported with safety, and played with by a child when unconfined; but when imprisoned they will tear down the hardest rock in liberating their These are some of the marvels of the age in which we live, but which some new scientific discovery may eclipse before many years pass over.

## THE NEW LIMEKILN AT INGLETON.

IN the spring of last year, Messrs. Clark, Wilson, and Co., began to build an extensive limekiln on the principle of a German patent. As the works have been completed under the management of Mr. Bagnall, C.E., and just been brought into working order, a description of the kiln is not without interest. The scene of operation, says the "Leeds Mercury," is one of unusual activity for this quiet Mercury," is one of unusual activity for this quiet neighbourhood. The kiln, which is built on a flat on the north side of a clear mountain stream, with millions of tons of limestone rock on its back, pre-sents at a distance, and especially from the railway sents at a distance, and especially from the railway bridge, a unique appearance. The kiln is oval, and measures in circumference 450ft., being surrounded by a road for the use of carts. At the height of 4ft. from this road, there is a platform all round the kiln, 64ft. wide. From the platform there are fourteen arched openings into the chambers, for the purpose of taking in the stone and bringing out the lime. Each chamber, which is 9ft. in height at the centre of the arch and 18ft. wide on the floor, is capable of holding 100 tons of limestone, and as the stone is calculated to lose by burning two-fifths of its weight in carbonic acid and moisture, a chamber yields at one draw about 60 tons of lime. As it requires many days to convert the stone into lime, and three days to cool a chamber before it can be requires many days to convert the stone into lime, and three days to cool a chamber before it can be discharged, 60 tons of lime is the amount produced per day. From the platform to the feeding chamber it is in perpendicular height 11ft., but, as the wall slopes, it measures 14ft. The feeding chamber extends over the whole of the fourteen lime chambers, and is 150ft. in length and 65ft in breadther which measures from the floor to the This chamber, which measures from the floor to the This chamber, which measures from the floor to the ridge 14ft., is covered over with a wooden roof, which cost £200. In this chamber, into which there are forty-one brick openings 6fft high by 5ft. wide, there are 424 feeding holes, through which, by the use of a small funnel and scoop, the fires are supplied with fuel. In the centre of this chamber are fourteen valves 2ft. 1in. in diameter, connected with the chambers which surround a central chamber in the kiln, called the smoke or carbonic acid chamber, through which the carbonic acid gas and moisture pass through a long flue and escape from a brick chimney erected on the top of Meal Bank. As all the smoke is consumed, and the men who feed the fires are under cover, and have only to use a wheelplace faith. With regard to the question of the relative powers of dynamite and gun-cotton, these appear also to be nearly evenly balanced; we may take it that for all practical purposes they are so. 500,000 building and firebricks, which cost about

£1,000, have been used in the erection of the kiln. The kiln, the licence of the patentee, and necessary material for carrying on the works, have cost about

# Aegal Intelligence.

ROLLS COURT, CHANCERY LANE, FEB. 16. Before the MASTER OF THE ROLLS.

CROSSLEY V. DIXON.

The arguments were resumed in this case, which involves the question whether certain portions of the mechanism of some Jacquard looms of an improved construction supplied by Messrs. Sharp, Stewart, and Co., to the defendants, and used by them in the manufacture of Brussels and velvet pile carpets, are infringements of the plaintiff's patent rights.

Mr. Grove, Q.C., Sir Richard Baggally, Q.C., and Mr. Cracknall appeared for the plaintiffs; Sir Roundell Palmer, Q.C., Mr. Jessel, Q.C., Mr. Speed, and Mr. Aston appeared for the defendants.

At the conclusion of the speech of Mr. Grove, Q.C., in reply,

His lordship, addressing him, said, in the event of his coming to a conclusion that the case was not governed by the decision of the House of Lords in the former suit of "Crossley v. Dixon," in 1863, he should most probably direct issues to be tried before a jury with reference to the questions of infringement; or, if the parties were willing, he would decide the question himself, in which case he should desire the attendance of one of the gentlemen on either side who had given evidence in the cause, with the models and portions of mechanism which had been produced in court during the hearing.

# Correspondence.

SMITH'S LIQUID FUEL FURNACE. TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—Referring to your notice, under the above heading, in last week's MECHANICS' MAGAZINE, I beg leave to point out that the injecting into furnaces of liquid fuel, in the form of spray, by means of superheated steam, so that it impinges against fireclay slabs or similar material, is well known as Messrs. Wise, Field, and Aydon's system, and is covered by Letters Patent granted to them in 1865. You may, perhaps, remember having witnessed one of the many successful applications of their apparatus at Lambeth more than two years ago, of which a report appeared in the Mechanics' Magazine of February 8, 1867, where a description of the arrangements is given. As the apparatus described in your last number is similar to Messrs. Wise, Field, and Aydon's, I trust that you will insert this letter in justice to the owners of their patent.—I am, Sir, yours, &c.,

Chandos Chambers, Buckingham, street Addalabi

W. LLOYD WISE Chandos Chambers, Buckingham-street, Adelphi, London, February 18, 1869. [As Mr. Smith's is a patented invention, and his

system has been in successful operation for a year or more, why have not Messrs. Wise, Field, and Aydon applied for an injunction against the alleged infringement of their invention?—ED. M. M.]

## TO CORRESPONDENTS

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly, payable in

oi £1 18. 8d. yearly, or 10s. 10d. half-yearly, payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Lotters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith, Ed. M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 61. per line, or 5d. per line for 18 insertions, or 4d. per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type, Special arrangements made for large advertisements.

JOHN BROWN, Peniston-road, Sheffield will find.

as type; Special arrangements inside for large agrerisements.

JOHN BROWN, Peniston-road, Sheffield, will find in M. Reimann's work on aniline and its derivatives, the information he requires respecting aniline colours. It is published by Messrs. Longmans, Paternoster-row, London.

L. W. B.—If you will send your name and address we can put you in the way of obtaining the information you require. We do not attend to letters which are not authenticated by the writer's name and address. We do not require these for publication, but as a proof of the writer's good faith. Many communications go direct to our waste basket owing to this omission.

H. A. K., whose letter we received last week, will also notice the above remarks. If, however, he requires the information asked, he will doubtless obtain it by applying at the City Chamberlain's Office, Guildhall.

G. D., Manchester.—Gun cotton has been so modified by Messrs. Prentice, under Professor Abel's system, that it can be, and is, used for sporting purposes inclosed in a cartridge case.

cartridge case.

RECEIVED.—G. E. D.—W. H. H.—T. F.—T. C. and Co.—
B. J.—E. F. M.—L. W. B.—W. S. W.—W. B.—C. S.—R. F.
—C. H.—J. E.—J. N.—J. B.—R. I.—E. H.—R. T.—W. S. B.
—F. S.—F. H. B.—E. S.—T. and R.—W. H. H.—F. C. D.—
J. M.—B. H.—G. W. H.—W. M.—B. B.—M. J.—E. de R.—
G. E. P.—S. E.—J. N.—B. H.—T. B.—J. H.—R. S.—W. S.—
S. and Sons—L. and Co.—E. D.—J. F.—W. T.—W. L. W.—
T. and B.—H. P.—F. G. and Co.

# Meetings for the Beek.

E-Royal Institution.—Rev. F. W. Farrar on "Comparative Philology," at 3 p.m.
The Institution of Civil Engineers.—Discussion on "The Lagoons and Marshes of the Mediterrean": and the following papers will be read:
—Mr. Jurie Bell, M. Inst. C.E., on "Sinking Wells for the Foundations of Piers of the Jumns Bridge, Delhi Railway"; and Mr. John Miroy, Assoc. Inst. C.E., will give a "Description of Apparatus for Excavating the Interior of, and for Sinking, Iron Cylinders," at 8 p.m.

D.—Civil and Mechanical Engineers' Society.—Mr. Charles W. Whittaker, holder of the First Prize, on "The Scarboro' Harbours Competition," at 8 p.m.

B.—Royal Institution.—Dr. John Harley on "Respiration, and its Influence on the Action of the Heart," at 3 p.m.

Royal United Service Institution.—E. B. de Fonblanque, Eeq., Deputy Commissary General, on "Reforms in Military Administration," at 3 p.m.

Royal Institution.—Professor Odling on "Hydro-

3 p.m.
SAT.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

# Habal, Military, and Gunnery Items.

THE winter general meeting of the National Rifle Association will be held at Willis's Rooms on Thursday, the 4th of March, at 2.30 p.m.. Field-Marshal his Royal Highness the Duke of Cambridge K.G., in the chair.

An Admiralty order received at Chatham Dock-yard directs the discontinuance of a number of intricate and useless returns. The result will be that a vast amount of unprofitable labour on the part of the clerks will be entirely got rid of.

WE hear that the full force of Colt's Armoury at Hartford, Connecticut, is now engaged on the con-tract to furnish the Russian Government with 80,000 Berdan rifles, and upon the 100 Gatting guns ordered. The armoury is to be enlarged.

THE Lords of the Admiralty have decided on the retention of the ropemaking establishment at Chatham Dockyard, which, on the abolition of the ropery department at Portsmouth and the other dockyards, will be the principal establishment for the manufacture of rope for the whole of the Navy.

A LETTER from Warsaw states that great con-sternation prevails in that city in consequence of a decision of the Russian Government to enlarge the fortifications. More than a hundred houses are to be expropriated, and the indemnities offered to the proprietors do not amount to two-thirds of the

The trial trip of the great Prussian iron-clad the "Konig Wilhelm," which was to have been made for speed down the river last Saturday morning, was unavoidably postponed until the next spring tides, owing to the boisterous state of the weather at the river's mouth, and a condition of wind and tide that would have material effect upon a trial made for most only. speed only.

THE silver medal of the Royal Humane Society which was voted to Lord Bury for his very courageous rescue of life at Christchurch, Hants, on the 6th October last, has been sent by H.R.H. the Commander-in-Chief to the Inspector General of Reserve Forces for presentation to Lord Bury in recognition of his galantry. Lord Bury is Colonel of the Civil Service Volunteers.

An important experiment was carried out at Shoe buryness on Thursday w.ek to test the safety of loaded shells for rilled guns and the effects produced when some are struck within a casemute by an enemy's missiles. The results were very satisfactory in showing that shells not actually hit would not be fired by a contiguous explosion of others.

ADMIRAL Sir Houston Stewart, G.C.B., has been appointed Governor and Visitor of Greenwich Hosappointed Governor and visitor of Greenwich Hos-pital at a salary of £1200 per annum. Sir Houston will have to vacate his good s.rvice pension, which will be placed at the disposal of Mr. Childers; but he will not have to leave the active list, and will, as a matter of course, rise in due order to be an Admiral of the Fleet. But, on attaining this exalted rank, his connexion with Greenwich will naturally cease.

THE last Friday evening lecture at the Royal Institution was given by Colonel Jervois, R.E., "On the Coast Defences of Great Britain." The gist of his authoritative remarks may be briefly thus put. minutes.

The armyand navy are the vital principles of defence the fortified arsenals and harbours are the centres of refuge and action for both. Take away the fortificaretuge and action for both. Take away the fortinea-tions, and the auxiliary forces cannot be turned to account; whilst the army will be utterly insufficient for the duties thrown upon it, and the navy will be scattered unsupported; and with no protected home.

THE first batch of 61 rifled guns, converted on the Palliser principle from smooth bore cast-iron guns, has been received at Woolwich. The guns have all been proved by the Royal Gun Factories, and 60 have been passed into the service, one gun being rejected for defective manufacture. A second batch of 30 guns is on the road from the Elswick Ordnance Works, Newcastle-on-Tyne. It is stated that Go-vernment have decided to convert a considerable number of cast-iron guns next year in the gun factories at Woolwich.

factories at Woolwich.

The trials of the old 68-pounder cast-iron gun, condemned as unserviceable from fissures in the vent after firing about 400 rounds in its smooth-bore state, and converted into a 150-pounder rifle gun upon Mr. Parson's principle, were reported by us. At the same time, an explanation was given of the severe test to which it had been put at Shoeburyness with satisfactory results, and the further endurance test it had to undergo at Woolwich. In the course of these tests a crack was observable, and the firing was discontinued by order. The gun has since been examined, and the tube has been ascertained to be perfectly sound, as the inventor predicted it would be.

examined, and the two has been ascertained to be perfectly sound, as the inventor predicted it would be. ACCORDING to the "Statistique Médicale de l'Armee Française pendant l'Annee 1866," contagious disease infected 97 per 1,000 of the effective strength disease infected 97 per 1.000 of the effective strength in that year, being an average loss of each patient's services for thirty days; the total loss being equivalent to the s rvices of the whole French army for nearly three days. All French garrison stations are under sanitary restrictions, and the beneficial effect of this restriction is well shown when the health of the French army is compared with that of the British the French army is compared with that of the British army. The number of men affected in the portion of the British army at home was, in 1866, 258-5 per 1,000 of mean effective strength, or nearly two and a-half times greater than in the French army. The average loss of each patient's services being about twenty-three days, and the total loss equivalent to the services of the whole army for almost six days.

# Miscellanea.

On Tuesday last the excavation of the shaft for the subway from the Tower to Southwark was commenced on the property of the Crown at Tower-

Professor Max Muller, who in 1858 had been elected a corresponding member of the French Institute (Academie des Inscriptions et Belles-Lettres), has just been elected one of the eight foreign Associates of that Academy.

THE Emperor of the French has presented to the library of the Upper Normal School of Paris a series of fine photographs, representing the highly interesting discoveries made by excavations amidst the ruins of the palace of the Cæsars in Rome.

THE following characteristic advertisement appears in a New York paper:—"If the party who took a fancy to my overcoat was influenced by the inclemency of the weather, all right; but if by commercial considerations. I am ready to negotiate for its return.—John Brougham, No. 325, West Fourteenth-street."

EARLY on Sunday morning a chimney stalk, 100ft. EARLY on Sunday morning a chimney stalk, 100ft. high, connected with the paper mills at West-end, Glasgow, fell during the gale. Near the base of the stalk were a row of cuttages, the roofs of two of which were crushed in, and the sleeping inmates were buried in the ruins. Seven persons were killed on the spot, and another died in the course of the afternoon. the afternoon.

DR. RICHARD QUAIN, F.R.S., President of the Royal College of Surgoons, delivered the triennial oration on Tuesday in the college hall, in honour of the memory of John Hunter. Formerly the orations were delivered annually. This was the first occasion on which the offices of crator and president have been combined since 1814, when the oration was delivered by Sir Everard Home.

THE following list of artists for the election of a corresponding member of the Academy of the Fine Arts, Paris, has been presented by the section of painting:—M. Podesti, of Rome; M. Rosales, of Madrid; and Mr. Leighton, of London. The Academy has added the following names to the list:— M. Daeger, of Dusseldorf; and Mr. Herbert, of London.

MR. SAMUEL PERKIN, of Beardon, in the parish of Boyton, near Laune ston, has met with his death under the following circumstances:—Deceased, in moving a hive of bees, broke the comb. He subsequently went to look at the bees, when one of them stung him in the neck, on or near the jugular vein. He immediately felt faint, and died in fifteen

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ELEVEN champion ploughing matches have already ELEVEN champion ploughing matches have already taken place this year in different parts of the kingdom, but the principal plough manufacturers have not sent their own men to compete for the prizes, but have left the success of their ploughs to the local ploughmen. Six of these matches have been won by men with Messrs. Ransome's ploughs, one has fallen to Messrs. Howard's, and the remainder to other makers. remainder to other makers.

AT a meeting of the Fellows of the Royal At a meeting of the Fellows of the Royal Botanic Society, held on Saturday last, Mr. Charles Robert Turner in the chair, the names of the following candidates for the fellowship were read:—Sir Charles Wheatstone, Mrs. Sowton, Baron de Teissier, Mrs. Weston, Mr. Charles J. Kino, Mr. James Purdey, Mr. Robert Alger Newbon, Mr. John Miles and Mrs. Merton, in addition to several elected on the same day.

At the ordinary meeting of the Society of Engineers, held on Monday, the 15th inst., Mr. F. W. Bryant, President, in the chair, a paper was read on "The Drainage and Water Supply to the Town of Fareham," by Mr. Thomas Buckham. The following candidates for election as members were announced—viz., Messrs. John Blackbourne, resident engineer, Limehouse Basin Improvement Works; and John Baldwin, engineer, Navarino-road, Dalston. road, Dalston.

On Monday morning the tide in the river Thames rose to an unusual height, inundating the wharves and warehouses adjacent to both banks, and causing considerable damage to property. In the low-lying districts at Lambeth, Vauxhall, Nine Elms, and Battersea, the water ran along the streets at an alarming pace, flooding the houses, and necessarily damaging property to a serious extent. At the upper part of the river the stream was swollen, and immense tracts of land lay under water, especially in the neighbourhood of Reading, Cookham, Maiden head, Windsor, and Datchet. head, Windsor, and Datchet.

WB read in the "Derby Mercury," in a report of a meeting of the Heanor Local Board, that "Mr. Beardsley, in a speech of some length, proposed the appointment of a qualified surveyor at a minimum salary of £20 per annum. It appeared that the person who at present filled the office of surveyor, when not employed as such was working above. when not employed as such was working along with labourers paid by the board, and Mr. Beardsley con-sidered that it would be much better to have the sidered that it would be much better to have the office of surveyor by itself. The proposition was not seconded, and so fell to the ground. The Board, however, agreed with Mr. Beardsley's views, excepting that they did not see their way to getting a sufficiently qualified person to undertake the office of surveyor at the salary in question." We should think not! think not!

think not!

At the end of 1867 the number of towns in Italy lighted by gas was 86. The annual production of gas amounted to 30,189,941 cubic metres (upwards of 1,066,016,916 cubic feet). The quantity of coke produced was 67,668 tons, and 6,968 tons of tar. The total value of these products amounted to 14,188,598 francs. Upwards of 1,177 workmen are employed in this industry, and their wages amount annually to 885,925 francs. The price of gas in the north of Italy varies in different towns from 40 to 50 centimes per cubic metre (equal to from 9s. 1d. to 11s. 4d. per thousand cubic feet). At Milan the price of gas is 45 centimes per cubic metre (10s. 2;d. per thousand.) The public lighting is, however, paid by the town at 28 centimes per cubic metre (6s. 4½d. per thousand), so that a street lamp consuming 120 litres per hour costs 0.0336 of a franc per hour. costs 0.0336 of a franc per hour.

AT a special general meeting of the members of the Newspaper Press Fund, held on Saturday last, at the offices, 24, Cecil Street, Strand; Lord Houghton the president, in the chair; the supplementary report and balance sheet for the six months ending Dec. 31st, 1868, showed that the invested capital of the 31st, 1868, showed that the invested capital of the society now stands at the sum of £4422 11s. 7d. consisting of £3122 11s. 7d. New Three per cents.; £700 Great Indian Peninsular Railway Debentures; and £600 Eastern Bengal Railway stock, guaranteed by the Imperial government. The grants made by way of relief during the past half-year amount to £165, or for the whole year just elapsed, to £305. The amounts so granted ranged from £10 to £50, and the cases relieved were 15 in number, all of them being of such a character as clearly to indicate the

Henry N. Dering, Charles Birtil Dunn, Foxon Foxon, E. R. P. Francis, Elliot Grasett, Thomas Green, Willoughby Green, Harcourt Griffin, Robert Landor, Mrs. Parsons, Mrs. Vaughan, Austin Vickers, &c. His Grace the Duke of Bucclouch, president of the society, has named his Serone Highness Prince Teck, Lieut. General the Hon. C. Grey, W. Wilson Saunders, Esq., F.R.S., and James Bateman, Esq., F.R.S., as vice-presidents for the present year. Henry N. Dering, Charles Birtil Dunn, Foxon Foxon,

THE proprietors of the London and County Banking Company held their annual meeting on the Banking Company held their annual meeting on the 4th inst, and a report of their proceedings appeared in our last impression. In glancing over this report we are struck by its highly satisfactory character. It appears that after paying interest to customers, and all charges, allowing for rebate, and making provision for bad and doubtful debts, the nett profits amount to £84,649 18s. 5d. This sum, added to £4,092 3s. 4d. brought forward from the last account, produces a total of £88,742 1s. 9d. The usual dividend of 6 per cent. for the half year was recommended, together with a bonus of 2½ per cent., both free of income tax, which will absorb £82,924 16s. 11d., and leave £5,817 4s. 10d. to be carried forward to profit and loss new account. The forward to profit and loss new account. The dividend for the whole year 1868 will thus be 161 per cent. We congratulate the proprietory and the management upon the prosperous condition of their

# Patents for Inbentions.

## ABRIDGED SPECIFICATIONS OF PATENTS.

FALENIS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chromological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce thom without an acknowledgment:—

BOILERS AND FURNACES-2352 2363 2406

BUILDINGS AND BUILDING MATERIALS—2386 CHEMISTRY AND PHOTOGRAPHY—2356, 2362, 2478, 2376, 2362

2396
CULTIVATION OF THE SOIL, including agricultural implements and machines—None
ELECTRICAL APPARATUS—2380, 2392
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2351, 2355, 2365, 2483, 2389, 2402
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2357, 2367, 2394, 2393
3405

5405 FURNITURE AND APPAREL, including bousehold utensils, time-keepers, jewellery, musical instruments, &c.— None.

MODE.

GENERAL MACHINERT—2381

LIGHTING, HEATING, AND VENTILATING—2349, 2396

METALS, including apparatus for their manufacture

2354 MISCELLANEOUS—2350, 2353, 2354, 2358, 2360, 2368, 2370, 2372, 2374, 2375, 2378, 2379, 2387, 2388, 2491, 2398, 2401, 2504

2504

ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2361, 2369, 2371
2532, 2390, 2399, 2400

SHIPS AND BOATS, including their fittings—2347, 2355
STEAM ENGINES—2345, 2355, 2398, 2403

WARFARE—2359, 2377, 2397

WARFARE—2359, 2377, 2397

2345 A. C. M. PRINCE, Trafalgar-square. Bell-pul. (A communication). Dated July 25, 1868.

The object of this is to facilitate the pull against the action of the bell spring, by converting the ordinary horizontal action of the handle into a downward lever action. This is effected by forming a slot at or near one end of the plate to which the bell-pull is applied, such plate being screwed to the door jamb; at the opposite end of the plate another slot is formed, across which a pintle or shaft is arranged, which consists of a wire or rold so placed in a mould as to be cast into and fastened to the sides of the slot. The handle consists of a bar or plate, to the outer side of which is secured an arm, terminating in a suitable knob or button, which may be of any ornamental form, and is attached to the end of the bar. To the inner side of the bar is secured a tongue, consisting of two parts, joined or hinged together. One end is firmly connected to the bar, and is slightly curved in a downward direction. The other part is also curved; the other end of this compound tongue terminates in a hook or eye, to which the bell wire is attached.—Patent abandoned.

2347 A. M. Clark, Chancery-lane. Steering ressels.

amounts so granted ranged from £10 to £50, and the cases relieved were 15 in number, all of them being of such a character as clearly to indicate the value of the benefits derivable under the fund. The roll book of the society comprises 247 members, of whom 170 are resident in London, and 77 in the country. The number of life members is 61.

The meeting of the Royal Horticultural Society, held on Tuesday last, was a most successful one there was a perfect blaze of flowers, among which the cyclamens and various forms of Chinese primproses were greatly admired. The collection of apples was most remarkable, not only for the numerous varieties which were exhibited, but for the wonderful state of preservation, considering the season. Mr. Wilson Saunders, F.R.S., presided, and the following candidates were elected fellows, viz.:—Lord Abinger, Samuel Asser, Francis H. Bacon, Edward George Barr, Mrs. Somerville Burney, Thomas Chapman, Major General J. W. Croggan,

the bows, and have two lateral branches, with a cock placed at the junction of the pipes, by placing one or other of the branch pipes in communication with the longitudinal pipes, a power is obtained at each end of the vessel for overcoming its inertia and moving it to the right or left.—Patent completed.

2348 A. J. Thorman, Lime-street. Molive power. (A communication). Dated July 27, 1868.

For this purpose a tank is employed, at the bottom of which are fastened two upright pieces, at such an angle from each side of the box as may be necessary; between these two pieces two wedge or trapezium pieces are placed. These are made so as to move to and fro against the sides of the upright pieces; another wedge or is-secles triangle-shaped piece is used which fills up the space; this is also made to move to and fro, and these three pleces are constructed so that as they may move forward or in one direction they are airtight or watertight at the sides in contact with one another, and also on the sides, in contact with the upright pieces; but having reached the distance that they have to move, two small plates or valves shift or open, which cause the contact between the wedge pieces to be broken, and allows them to return freely when the two small plates or valves again occupy their places or are shut. Adjoining, is another wedge-shaped or right-angled triangular piece, which is also made to move to and fro, having at the same time a movement from side to side. This piece has a stud or pin which works in a groove of a slide-piece, and this slide-piece is driven, it will give the former a side to side motion as well as to and fro, causing the resistance to be materially diminished.—Patent sbandoned.

2349 J. A. Hoog. Edinburgh. Lamp. Dated July 27, 1868. This lamp is constructed as follows:—Two tubes are

materially diminished.—Patent abandoned.

2349 J. A. Hogo, Edinburgh. Lamp. Dated July 27, 1868. This lamp is constructed as follows:—Two tubes are employed on the Bunsen lamp principle, one of which is of smaller diameter than the other; the smaller tube is of smaller diameter than the other; the smaller tube is of placed within the larger tube; one of the tubes is placed in communication with condensed gas or air, or a mixture of both. The mixture of gas and air is passed through a perforated plate of platina, or a tissue of platina wire gauze, by which it is divided into numerous small jets. The minute jets pass through the interstices of the platina, and are ignited. The metal soon becomes incandescent; the supply of air being duly regulated, combustion is made perfect, flame disappears, and the platina or metal becomes a surface of intense light. Sometimes, instead of using a mixture of gas and air, compressed or condensed gas may be used by itself, and air at the ordinary pressure. Sometimes the gas and air may be heated before being burnt, to obtain a maximum effect.—Patent completed.

2350 G. R. V. Loughton and E. B. Jankson, Paris

obtain a maximum effect.—Patent completed.

2350 G. R. V. LOUGHTON and E. B. JACKSON, Paris Composition for bosses. Dated July 27, 1868.

The composition consists of from 60 to 80 per cent. of india-rubber, and 30 to 50 per cent. of pure golden sulphuret of antimony, which are mixed together into a paste. The bosses made of this paste are submitted to a process of vulcanization by the ordinary methods.—Patent completed.

paste. The bosses made of this paste are submitted to a process of vulcanization by the ordinary methods.—Patent completed.

2351 J. Hteeln, Manchester. Printing fabrics. Dated July 27, 1868.

This consists in a new method of making chloride of aniline, or aniline black, by the admixture of sesquichloride of chromium. Instead of combining the aniline with an acid, as at present, when making aniline black printing colour, a solution of a metallic chloride is mixed with it, the base of which is not injurious to the proper oxidation of the aniline. From this means, the aniline combines with the chlorine in definite proportions, and chloride of aniline free from excess of acid is formed. According to the metallic chloride used, the metallic base is in some cases either wholly or partially precipitated, and in other cases no precipitation takes place, a liquid being obtained containing aniline, chlorine, and the metall. The sesquichlorides of iron and chromium are most suitable for this purpose, of the following proportions.—100 parts by measure of aniline of commerce, and according to the saturating power of the aniline from 250 to 250 by measure of asolution in water of sesquichloride of iron, containing iron equal to twelve grains of peroxide of iron, in 100 grains measure. When operating with sesquichloride of chromium alone, the following proportions are used:—100 parts of measure of aniline of commerce, and from 400 to 450 parts by measure of a solution of esquichloride of chromium in water, marking 50 deg, on Twaddell's hydrometer. These mixtures may be used in place of the chloride of aniline employed.—Patent completed.

2352 J. LEWIS, Preston. Consuming smoke. Dated July 27, 1868.

This consists in procuring oxygen gas from any oxygeneous compound by passing a current of steam through a retort charged with such compound, and thence by pipes through or under a fire or hot air chamber, thence to the bridge of a furnace, or at the back of any fire, when a volume of unconsumed carbon has to pass, such oxygen ga

takes place.—Patent abandoned.

2353 C. J. LAURENDEAU, Paris. Saving life. Dated July 27, 1863.

This apparatus is composed of a quantity of thick cork sufficient to float and sustain a person in the water, and is adapted to the abdomen and a part of the chest. A second supply of thinner cork is placed between the shoulders, and reaches to the nape of the neck. This arrangement is intended to produce perfect equilibrium, the part of the body unfurnished with cork acting as ballast. Should the batter desire to swim under water, the collar is removed, or the buoyant part turned from the side of the principal piece, and being furnished with nippers for closing the nostrils and a pipe or tube to breathe through, the end of which terminates in a funnel of cork, so as to float on the surface of the water; and, finally, a person may remain which terminates in a funnel of cork, so as to float on the surface of the water; and, flually, a person may remain and swim a considerable time under water, by making the principal piece of the apparatus both a means of buoying up the body and an air reservoir, from which the bather expels and draws in air by means of a double tube, the reservoir being divided into two compartments by an elastic partition. But this apparatus is intended only for good swimmers, and it would be necessary to carry ballast.—Patent completed.



2354 H. A. DUFRENE, Paris. Indicator. (A communication). Dated July 27, 1868.

The distance mechanism consists of a pulley turned on the nave of one of the hind wheels of the vehicle. This pulley is connected to the mechanism by a round strap passing over an intermediate pulley held by a support underneath it, and passing over another pulley mounted on a shaft adapted to the bottom of the botty of the carriage. On this shaft is mounted an endless screw communicating motion to an indicator. The indicator is adapted to the lower rod of a drum placed on one side of the seat, and on which drum is placed a flat band with a sheet of paper attached to it; the strap is kept fast at the other extremity of the seat by another drum. The seats are divided into places; each place works independently of the other, and all the places are supported at their four corners by springs; on the lower part of the surface of the woodwork supporting the cushion, and at each place, a perpendicular rod with two oblique sides is adapted. When the travellers sit down, the seats descend till they reach fixed points; the rods adapted perpendicularly underneath by means of the oblique side, which is opposite the strap, forces against it pencil rods or needles, and the sheet of paper placed on the strap takes the mark and indicates the distance travelled over by the occupants.—Patent abandoned.

Patent abandoned.

2355 A. V. Newfon, Chancery-lane. Propeller. Dated July 27, 1868.

The propeller consists of a frame, fitted with floats, fixed to axies, which vibrate in journals. When floats are arranged horizontally, they are so adjusted that the lower edge of each float shall rest over the axie of the float below it. When they are arranged vertically, the edges of the float not attached to the axie are adjusted to rest on or against the frame. The propeller is attached or connected to the lower end of a vertical lever, adjusted at the stern sides, or through the bottom of a vessel. The lever may be either made to swing or oscillate on a fixed axie, or be rigidly attached to an axie, made to rock in journals, or be passed through an axie which is enlarged and perforated in its centre. This latter form of attachment is chiefly used to give the vessel a backward motion by reversing the propeller. The lever is operated by a horizontal engine, attached to its upper end. When the lever is set in motion by the engine, attached to its upper an ishorter extremity, the lower and longer extremity carries the propeller backwards and forwards between any two points deemed most favourable to propulsion.—Patent completed.

2356 F. LAMB, A. C. STERRY and J. FORDRED, Rother-backs.

completed.

2356 F. LAMB, A. C. STERRY and J. FORDRED, Rotherhithe. Treating oils. Dated July 27, 1868.

A quantity of oils, fats, or wax, is placed in a suitable vessel, and about 10 per cent. of fuller's earth, in a finely divided state, mixed therewith. These are stirred well together for about thirty minutes, at the same time raising the temperature of the mixture gradually, and maintaining it at about 2004eg. Fah.; it is then allowed to settle, and the oil being drawn off into another vessel is then treated in the same manner with a further 10 per cent. of the fuller's earth. This operation may be repeated until a sufficient bleaching and purilleation has been effected, when the oil may be filtered or left to repose in tanks till it becomes bright and fit for use. In the case of some substances, such as linseed or rapesced oil, where a treatment with sulphuric acid can be used as a means of purilleation, a preliminary treatment with that acid is made. The acid and impurities are allowed to settle down, and the supernatent oil is drawn off into a separate vessel before the addition of the fuller's earth.—Patent completed.

2357 A. M. CLARK, Chancery-lane. Artificial ice. Dated

2357 A. M. CLARK, Chancery-lane. Artificial ice. Dated July 27, 1868.

The water to be congealed is first introduced into one set of vessels, so as to about two-thirds fill them. A disc is then placed on the rim or flange at one end of the apparatus, and a cover applied so as to close the mouths of the vessels; the cover is fixed by a screw. The freezing salt used (such as nitrate of ammonia) is then introduced into the apparatus, with the requisite quantity of water, and another disc similarly provided with recipients placed in position at the opposite end, which recipients are closed by a cover, secured as before-mentioned, so as to hermetically close the apparatus. The apparatus is then set in motion for about ten or a dozen minutes, after which, hollow cones of fee, measuring only two-fifths of an inch in thickness, which deposit on the interior surface of the recipients, are removed, and introduced one in the other.—Patent completed.

2358 C. A. McCurd, Bloomsbury. Swing machines.

other.—Patent completed.

2358 C. A. MCURD, Bloomsbury. Sexing machines.
Dated July 28, 1868.

At the upper part of the frame of the machine is a hori
zontal revolving shaft mounted in suitable bearings; a dise
is fixed to the left hand end of this shaft, having on its
face a stud which works in a suitably formed slot in the
needle slide. At the back of the disc is another stud
which lifts the foot which receives its feed motion from
the edge of the disc. At the right hand end of the shaft
is a wheel with a handle on its face; a link descends from
this handle to a crank fixed to a shaft at the lower part of
the machine. At the other end of this shaft is a vibrating
hook or looper, part of the ring of which is concentric
with the point depressed towards the axis.—Patent abandoned.

2359 W. F. M. GREEN, Sunbury. Loading guns. Dated

2359 W. F. M. GREEN, Sunbury. Locating guns. Distent July 28, 1868.

The object is to perform by machinery the operations of ramming home the charges of muzzle-loading big guns, cannons, and other ordnance, and sponging them out. This is effected by the substitution of a spiral spring, or compound springs, or other arrangement having an equivalent property of expansion and contraction for the rammod or other means as ordinarily adopted. —Patent abandoned.

2360 W. LEWIS, Redditch. Needle wrappers. Dated July 28, 1868

2300 W. Lewis, measurem. Actual w. appear. Date July 28, 1868.

The patentee takes a piece of paper, the same width as the ordinary needle wrapper, and of a length of about one-third greater. One end of the paper is provided with a flap or tongue, made by cutting away the sides of the paper. The blank or paper is divided into three parts, by transverse folds or creases, and the paper is provided with the ordinary longitudinal folds or creases. In the bottom division or part of the paper, and in the middle of the paper, a cross silt is made. By folding the bottom part or division of the paper upon the middle part, a pocket is formed, in which the needles may be placed, and held. The needles are placed loose in this pocket by

being passed through the slit described, the points of the needles resting on the folding edge of the lower part or division of the paper, and the heads and other parts of the needles being exposed on the outer side of the folded part of the paper. The lower part or pocket described may be provided with a flap, by folding down, while the heads and other parts of the needles may be covered. The wrapper containing the needles is folded up in the ordinary way, and is secured in its folded condition, by the flap or tongue, at the top of the wrapper, being engaged in a slit or under a band made in the middle part or division of the paper wrapper. According to another arrangement of this invention, a wrapper is made for holding two or more series of needles in the following manner:—A piece of paper, of about the length of the ordinary needle wrapper, and of a width about double that of the ordinary wrapper, is taken. The paper is divided into three parts or divisions by longitudinal folds or creases, instead of by cross folds, as in the wrapper before described; on one end of the paper a flap or tongue is made. By folding one of the side parts or divisions of the paper upon the middle part, a longitudinal pocket is made, the other side part constituting a side flap, which may be folded upon the pocket. The wrapper thus made is again divided by cross creases or folds into four or other number of divisions, in two or more of which longitudinal slits are made, through which the loose needles are passed. There is thus formed a needle wrapper, in which two or more series of loose needles are held in the same wrapper. The inner folded edge of the pocket described may be provided with a courinnous flap, or two or more flaps, by folding which, the heads and upper parts of the series of needles may be covered. After the needles are put into the several divisions of the longitudinal pocket, when the latter is folded up at its cross folds or creases, and fastened by the flap or tongue at the top, or at one end, being en caged i

2361 H. WATTS, Water-street. Permanent way. Dated

2361 H. WATTS, Water-street. Permanent way. Dated July 28, 1868.
This consists in constructing rails in which a groove is formed in the upper side; into this groove, a strip or length of clastic material is fitted, preferably of vulcanized indiarubber. The clastic material may be secured in the groove by transverse bolts or otherwise. The wheels of the train in passing bear on the clastic material, which tends to deaden the noise ordinarily produced.—Patent abandoned.

2362 E. S. T. STEANE, Barking. Shap. Dated July 28,

In order to manufacture one ton of soap, the patenties bils from lewt, to 2ewt, of oil, grease, or fatty substances, with 2ewt, 3ewt, or 4ewt, of caustie soda lees, for one, two, or three hours, to which is ad led separately. Sewt, 10ewt, or 12ewt, of lime water, from 2ewt, to 3ewt, of sola crystals, 2ewt, to 3ewt, of silicate of soda, from lewt, to 2ewt, of common salt or salt cake, and 4ewt, of nitre cake. The matters are boiled together for quarter or half-hour, lime water being added as the boiling proceeds to compensate for evaporation, and the mixture is then framed and crutched until it sets. By combining materials in the above mentioned manner, a soap may be produced of equal quality to that at present requiring twice the quantity of goods or fatty substances. In order to give wear to the soap, there is added thereto, during the above process, any suitable proportion of animal matter, such as horn or bone dust, integuments of animals, or ground cereals, pulped vegetables, or other suitable substance.—Patent abundoned. In order to manufacture one ton of soap, the patentee

2363 S. HYDES, Sheffield. Heating and cooling. Dated

pulped vogetables, or other suitable substance.—Patent abandoned.

2363 S. Hydes, Sheffield. Heating and cooling. Dated July 28, 1863.

This invention consists, first, in the application of guides or channels, to direct hot gases or fluids to the surface of their containers, such as flues, tubes, ogother channels, for the purpose of more fully developing and absorbing the caloric from the gases or fluids, and using the same for any specified purpose, which caloric would otherwise be lost by passing away through the body or central part of the fluos or tubes. Second, in applying on each or only on one side of a partition (situated between hot and cold), guides or channels, through which air, fluids, or gases are guided in parallel lines, or nearly so, or in cross lines, and in constantly circulating streams which pass instantaneously within the most effective distance over and entirely cover the whole surface of the partition to be acted upon for the purpose of transferring their heat or caloric from one fluid to any other fluid. Third, in passing hot liquids through flues or tubes, and by directing cold air or water against the outer or cold side of the partition, to cool the liquids, and thereby operate as a refrigerator. An upright flue or duct is enclosed, and against the outer surface of one side guides or channels are attached, with openings therein for directing cold air or water against such side surface. Guides are fixed in the enclosed part of such flue or duct, the guides being formed with horizontal partitions across them for arresting the direct passage of the heated air, fluids, or gases, over and through them, and thereby causing them to pass under the edges of the guides, and pass thence against the surface of the cooled partition of the flue or duct, and through and between the other half of the guides, situated at the other sides of their respective horizontal partition and so on through each set of guides, there being several sets fixed in the closed flue. The heat thus collected on the cooled

Patent completed.

2364 J. Webster, Birmingham. Refning metals.

Dated July 28, 1968.

Atmospheric air is forced through or over hydrochloric acid, for the purpose of taking up hydrochloric acid gas or vapour, for application in the manufacture or refining of iron, while in a fluid or molten condition. Also in causing atmospheric air in a cooled or heated state to be forced into or over hydrochloric acid and then through naphtha or volatile spirit, for the purpose of taking up hydrogen and carbon gas or hydrogen and a portion of the carbon from the volatile spirit. The gas is then forced through, into, or over the metals while in a molten state, for the purpose of taking up sulphur, phosphorus, silica, or carbon, or other impurities, which the metal may contain.—Patent completed.

friction to the rollers or beams over or under, which the fabric passes for the take up. The object of another part is to clear the wefts when oscillating shuttle boxes are used. An arm stands out from a rod, carried by one of the swords, or by the framing of the batten, when raised lift one of the wefts out of the way. The shuttle, when the boxes are in one position, acts on the weft of that shuttle, and, when the boxes are in position to hold one weft down, the shuttle of the other passes over it thus the wefts of the respective shuttles will be acted upon correctly by the weft forks.—Patent abandoned.

2336 I BULLDHOU Accident Shuttles Dated Inly 28.

2366 J. Bullough, Accrington. Shuttles. Dated July 28,

This consists in so making shuttles that they shall be free to swivel on centres.—Patent completed.

free to swivel on centres.—Patent completed.

2367 C. A. LA MONT, New York. Preserving segs. Dated July 28, 1868.

This consists in the production of an improved preparation of egg in small thin flakes, scales, or particles, readily soluble in cold water, of a bright clear colour, and fresh pure quality, and which, when dissolved in water, and beaten up, possesses the qualities and characteristics of freship beaten eggs. This new article of commerce may be most readily produced by taking fresh eggs, beating them up thoroughly, and then immediately drying the resulting batter in a thin film upon revolving metallic plates in a current of pure air, heated or not, in a drying chamber. Sulphate of lime or other preservative chemicals not injurous to health, may be added to the egg batter, before drying, to insure a more perfect preservation of the purity and freshness of the prepared egg.—Patent completed.

2363 W. R. LAKE, Chancery-lane. Glue. Dated July 28

2363 W. R. Lake, Chancery-lane. Gue. Dated July 28 1864.

The first part relates to the condition of the glue when ready for sale and transportation, and consists in its manufacture in the form of thin flakes or scales. The second part relates to the means of trying on the fluid or semi-fluid in iterial to be dried, and consists in the employment of plates of porcelain, or surfaces not affected by the scidis in the glue, for the purpose of drying the thin ilims thereon; the plates are dipped two or more times in the liquid, chilling it between each immersion, and thereby taking on a thicker and more uniform coat; also in pouring or throwing the glue upon the plates where it is not convenient to immerse them. The third part relates to means for presenting the glue upon the plates on a carrier, as a wated or belt, to be exposed to drying influences. Also in means for adjusting a series of plates on a carrier, as a wated or belt, to be exposed to drying influences. Also in the employment of delectors, which disturb and deflect the air on the outside of the channel in which the plates are carried; also in the employment of inside deflectors, which disturb and deflect the air on the inside of the channel, these latter deflectors being ordinarily carried on the belt or wheel, and moved with the plates; also in the combination of both outside and inside deflectors, arranged to mutually act on the currents of air, and to agitate and disturb them, and complete them; also in a peculiar construction of the apparatus, by making the flexible part in the form of a chain having rigid links, and by making the pulleys in the form of prisms, corresponding thereto; also in the employment of the sir thus circulated, with or without the employment of hear is also in the manner of employing two currents of air, the one cold for chilling the glue and the other either warm or chemically dried; also in the general combination of a carrier, with glue presenting surfaces, rotating on axes carried thereon, and with drying currents of air.

in a vacuum, or in drying currents of air.—Patent completed.

2369 S. M. MARTIN and S. A. VARLEY, Holloway. Trais signals. Dated July 28, 1863.

The patentees wrap spirally round a soft core of hemp, one or more wires to form a strand; any number of these strands are arranged side by side and bound together; the one or more wires to form a strand; any number of these strands are passed through a bath of melting marine glue. The conductor at one end is connected to a miested plate attached to the wooden face of the buffers; the other end of the conductor is connected to an insulated wire running from end to end of each vehicle. Electric bells are arranged with electro-magnets, the soft iron cores of which, fit into a block of cast iron forming one solid piece with the frame, to which the other working portions are attached. To the pole of one of the soft iron cores a soft iron horn is attached, which forms the extension of the pole; between this horn and the pole of another small electro-magnet, a magnet (by preference a perm ment one) works, which, for distinction, is called the "stopping lever." The small electro-magnet is usually rendered magnetic by induction from a permanent magnet; a striking lever carrying a hammer is attached to the armature, which is attracted by the electro-magnet when rendered active. There is a projecting or stopping piece attached to the striking lever, which catches on the top of the stopping lever, and prevents the hammer striking the belt; if set in motion by oscillation, when the circuit is closed, the electric current reverses the magnetism in the small electro-magnet, repelling the "stopping lever," which is attracted towards the soft iron horn, and gets out of the way of the stopping piece attached to the striking lever.—Patent completed.

2370 A. Morrall, Warwick. Needles. Dated July 28,

2370 A. MORRALL, Warwick. Needles. Dated July 28,

2370 A. MORRALL, WARWICE. Necues. Dated July 28, 1868.

The eyes of the needles are formed in such a manner that the needle having been threaded, the thread may be securely retained in the eye the time the needle is employed in its work. It consists in forming a kind of double eye, or an eye having a double curve, which, from its shape, forms two separate eyes, but connected together, the upper part being nearly round and smaller than the lower part, which is of an oval or loop shape. The needle is threaded in the lower or larger of the two parts, and when the needle is used, the thread or sewing material will be drawn up into the head or smaller part of the eye and be therein contracted. The ordinary tension will be insufficient to disengage the material from the eye.—Patent completed.

over the metals while in a molten state, for the purpose of taking up sulphur, phosphorus, silica, or carbon, or other impurities, which the metal may contain—Patent completed.

2365 G. HODOSON, H. BOTTOMLEY and E. COCKROFT, York. Looms. Dated July 28, 1868.

The object of one part of the invention is to obtain

paid previously marked thereon, or such amount may be marked thereon at the time of payment, as is now frequently the case; the person having such ticket is required to place it in the box or receptacle before mentioned, or to see that it is so placed by the person in charge.—Patent abandoned.

2372 J. SIMPSON, Manchester. Moulding wheels. Dated 29, 1868

2372 J. SIMPSON, Manchester. Moulding wheels. Dated July 29, 1868.

This consists in constructing machines for moulding toothed wheels from a segment pattern. Also in an improved arrangement of the dividing apparatus for moulding wheels with an even and uneven number of moulding wheels with an even and uneven number of teeth, and in an arrangement of graduated slides for determining the diameter of the wheel to be moulded. An iron ring or turntable is litted upon a circular V projection, and free to be turned thereon; there is another ring, which holds a rack with teeth inside and outside, a pinion works on the inner teeth to move the ring round, another pinion grears into the outside teeth, a slide is fitted across the apparatus, a segment of a wheel is placed in the first mentioned ring, a sand floor or base is prepared, and the segment placed on and pressed into it, whereby an impression is obtained. The segment is then removed and turned a given distance, and again pressed into the sand, to obtain a mould for another portion of the wheel. This operation is repeated until the whole of the mould is made. The top edge of the apparatus is divided so that wheels of any number of teeth can be constructed.—Patent completed.

2373 F. Winser, Manchester. Epson salts. Dated

number of teeth can be constructed.—Patent completed.

2373 F. WINSER, Manchester. Epson salts. Dated
July 29, 1368.

In order to make Epson salts, the patentee puts carbonate of magnesia or dolomite into gas purifiers, either
dry or saturated, for the purpose of purifying and freeing
illuminating gas from sulphur and other impurities. Or
he places the magnesia or dolomite in chambers or
furnaces, and introduces into the chambers or furnaces
sulphurous acid gas produced by burning any sulphides or
bisulphides of earths or metals, by which means sulphides of magnesia are produced, which sulphides are
converted into sulphates by any known methods.—Patent
completed.

2374 J. MABSON, Norwood. Cinder sifter. Dated July 29.

1868. A shovel is made in two parts; one part forms the scoop for lifting the cinders and ashes, and the other forms a box into which the ashes are free to enter when the front of the shovel is raised and agitated, a grating being fixed across the shovel through which the ashes pass. To the back of the shovel a bar is hinged, one end of which forms a handle; the other end has a plate on it, which is forced into or enters the ash compartment against the rails of the grating, and retains the ashes in that compartment; when the plate is down, as just mentioned, the cinders may be thrown from the shovel on to the fire, or elsewhere. The shovel is fitted with a fixed handle by which it can be lifted or moved from place to place.—Patent completed.

2375 E. Herring, Beer-lane. Treating mail. Dated

2375 E. HERRING, Beer-lane. Treating mail. Dated July 29, 1863,
The object of this invention is the conversion of saccha-

The object of this invention is the conversion of saccharine solutions into grape sugar, and the precipitation of the albuminous and nitrogeneous matters held in solution during, before, or after fermentation. The patentee puts into a converting vessel such a quantity of sugar cane in a dried and coarsely powdered state, as shall contain 1851b, to 1951b, of dry saccharium, which is about equivalent to the quantity of saccharium matter usually contained in a quarter of malt: water is added which is acidulated by mixing 4lb, of sulphuric acid of about specific gravity of 1843 previously diluted with 2 gallons of water, the temperature being about 50deg. Fah., with or without 4lb, of solution of bisulphide of lime, and the acidulated water being added in successive portions so as to exhaust and dissolve the sugar contained in the various substances, and ultimately to obtain 72 gallons of saccharine solution.—Patent completed.

2376 W. R. Lake, Chancery-lane. Substitute for linsed

—Patent completed.

2376 W. R. Lake, Chancery-lane. Substitute for linseed oil. Dated July 29, 1868.

In order to prepare the compound, the following ingredients are mixed together,—carbon oil, resin, becswax, litharge, gum caoutehoue, and spirits of turpentine. These are mingled in the following proportions:—10 gallons of carbon oil, 151b. of resin, 40z. of becswax, 40z. of litharge, 10z. of the gum caoutehoue, and 1 gallon of the spirits of turpentine. This mixture is compounded as follows:—The carbon oil and resin are mixed together by subjecting the same to heat until the resin is thoroughly dissolved. To this heated mixture the becswax and litharge are added, the becswax and litharge having first been boiled together, and allowed to cool and settle. The gum caoutchoue is then dissolved in the turpentine, which is then mixed with the compound, and the same is ready for use.—Patent completed. completed.

completed.

2377 W. R. LAKE, Chancery-lane. Firearms. Dated July 29, 1868.

This consists chiefly in a novel construction of the firing pin, and in its peculiar arrangement in combination with the bolt and breech shoe, whereby the danger of accidentally exploding the cartridges, either by pulling the trigger or otherwise, is entirely obviated. The invention also consists in the novel mode of preventing the binding or striking of the bolt in its chamber, also in the peculiar construction of a stop, which prevents the accidental removal or escape of the bolt from its chamber, and at the same time allows it to be readily removed when required for cleaning or other purposes: also in the novel arrangement of the parts of an ordinary gun lock for increasing the strength and durability of the same.—Patent completed.

2378 W. R. LAKE, Chancery-lane. Seeing machines.

Patent completed.

2378 W. R. Lake, Chancery-lane. Sacing machines.
Dated July 29, 1868.

This consists partly in the arrangement of a continuous shaft in combination with several discs which produce the motion of the crotchet needle and awl, and the various other parts, in such a manner that an independent motion can be given both to the needle and to the awl, the discs being adjustable on the shaft, each independent of the other, so that a correct motion of the various parts in relation to each other is ensured; also in the arrangement of an independent oscillating needle stock and an independent oscillating awl stock in combination with lever, segments, and toothed quadrants. Either of these instruments can be made to "dwell" or remain stationary at certain stages of its motion, as the nature of the work may require; further, in the arrangement of an oscillating lever forming the bearing for the pivot of the needlestock

In combination with a lever segment and toothed quadrant, in such a manner that by the action of the oscillating lever a motion away from the stationary axis of the awl stock is imparted to the needle stock and needle without throwing the toothed quadrant out of gear with the lever segment; also in the arrangement of a locking lever in combination with the oscillating lever which carries the needle stock. Also in the thread carrier which receives a vibrating and a transversely sliding motion in such a manner that the thread is looped round the hook of the needle without fail, and with perfect regularity. Also in the arrangement of a barb coverer in such a manner that by the action of the said barb coverer the barb of the needle is covered at the proper intervals, thereby preventing the same from catching in the loops on its return strokes; also in the arrangement of a loop guide in combination with the feeder and with the oscilating needle; in the arrangement of a spiral spring and stop working on the periphery of the awl shield and stop working on the periphery of the awl shield and stop working on the material. Also in arranging the needle and the needle shield in such relation to each other that when the needle is in its outer position, to draw the loop tight, its hook or barb is entirely inside the shield, thereby holding the needle steady, and preventing the loop from getting out of the barb; further, in the arrangement of a rising and falling lever, and of a transversely oscillating lever in combination with the feeder. Also in the arrangement of a stop motion.—Patent completed.

2379 A. V. Newton, Chancery-lane. Polishing powder.

2379 A. V. NEWTON, Chancery-lane. Polishing powder. Dated July 29, 1868.

The powder, more or less coarse, which forms the subject of the present invention, is obtained from bauxite. The powder of bauxite, placed in a suitable vessel, is steeped in concentrated acid and heated to a temperature of from 104deg. to 122deg. Fah.—Patent completed.

of from 104deg, to 122deg, Fah.—Patent completed.

2330 J. R. Harper, Clerkonwell. Telegraph cables. Dated
July 29, 1863.

In order to carry out the invention, the patentee casts
zinc or its alloy after being rolled into a cake or plate
which is cut into strips by means of a circular saw. The
strips, after being annealed, are then drawn through a die
so as to partially reduce them, and any burrs or ragged
edges produced by the drawing process are removed. The
annealing and drawing processes are then repeated, the
burrs being removed between each process, when necessary, until the bar of zinc or its alloy is reduced to the
form of a wire of the size required. The wire is employed
in the manufacure of telegraph cables.—Patent abandoned.
2381 J. RADCLIFEE Durham. Steam hammers. Dated

2381 J. RADCLIFFE, Durham. Steam hammers. Dated

2381 J. RADCLIFFE, Durham. Steam hammers. Dated July 29, 1868.

This consists in employing two steam cylinders, made to act in such a manner that, when the piece of iron under operation is pushed to one side of the anvil by the piston of one cylinder, the mass can be lifted by the other cylinder to enable the workman to turn and hold the mass in any position.—Patent completed.

der to enable the workman to turn and hold the mass in any position.—Patent completed.

2382 H. O. ROBINSON, Glasgow. Dredger. Dated July 29, 1868.

This consists of a helical or spiral cutter placed in and revolving in a cylinder, and driven by a shaft or prime mover. Attached to the upper end of the cylinder is a tube through which the dredged material, mixed with water, passes or is driven upwards, to assist which small screw propellers are made to operate within the tube. The cylinder, with the spiral cutter and tube, is placed in a floating vessel in an inclined position, and the spiral cutter is urged against the bottom by drawing forwards the vessel in the usual way.—Patent abandoned.

2333 S. C. LISTER, York. Cutting pile fabrics. Dated July 29, 1868.

This consists in so arranging the cutting instrument that it shall cut only in one direction. This may be accomplished by causing the slide or race in which the knife moves to recede so that the knife shall be out of action whilst moving in one direction. Another part consists in weaving pile fabrics face to face in the grey, that is, in the undyed state, and subsequently dyeing them as hereinafter described. In weaving silk velvets, the pile yarn has always been dyed on account of the difficulty of dyeing such goods after being woven without injuring the pile. Cotton velvets, such as are made at Manchester, are woven in the grey, and then the pile loops are cut by hand, but as the pile of these goods is not woven to stand upright, but is a sort of bastard pile or nap, there is no difficulty in dyeing and finishing them. For dyeing and finishing silk and cotton velvets woven in the grey as above described, they are subjected to the dyeing process whilst held distended, so that they may be dyed and finished without handling. This is done by fixing or extending them on a wheel of equal circumference to the length of the piece. The wheel with the velvet is then placed in a dyeing vat, and slowly turned until the velvet is properly dyed; the wheel is then rem

brushing frame and thoroughly brushed, which greatly improves the velvet.—Patent completed.

2384 J. JEFFREYS, Norwood. Preserving food. Dated July 29, 1868.

The patentee constructs a long rectangular tube on a steep inclination. It is divided by longitudinal and upright partitions into passages alternately narrow and broad. Up the narrow passages and down all the broader passages a chilling current is forced. Flat oblong cases, charged with the matter to be frozen, are slid edge forward on rollers into the bottom of the passages. The lowermost row of cases forming the front ones of each long tier are, when hard frozen, let out of their passages by a trap door under the trunk, which, in falling, raises its hinge end to stop the descent of the tiers behind, and is closed instantly that the front row of cases is discharged. The tiers then slide down a stage, the foremost cases occupying the position of those discharged. A fresh set is then introduced into the furthest and upper extremity of the trunk. Thus the chilling currents, as they ascend, draw heat from the cases in succession, and before leaving the trunk, become nearly as warm as the uppermost row of cases. At the same time, the cases in descending fall in temperature when in its nascent state. Thus the two important principles of gradative heat conduction and continuous operation are effectively established.—Patent ompleted.

2385 J. WOLSTENHOLME, Lancaster.

2385 J. WOLSTENHOLME, Lancaster. Valves. [Dated July 30, 1868.]
This consists in constructing the valves for admitting steam to an engine cylinder, and for discharging the exhausted steam. The valves are cylindrical; they cover and uncover the ports leading to the steam cylinder, and to each valve is cast a semicylindrical projection which alternately covers and uncovers the exhaust ports. There is also a passage through the semi-cylindrical projection to allow a portion of the exhausted steam to escape before the lip of the valve uncovers the exhaust port, thereby allowing the valve to complete its traverse. The valves are moved to and fro by an arm on the piston rod acting on adjustable shoulders fixed to the valve spindle. By this arrangement the valves are placed near each end of the cylinder. The steam passages are reduced in length, and consequently steam is economized.—Patent abandoned.

and consequently steam is economized.—Patent abandoned.

2386 G. WOODHOUSE and J. G. M'MINNIES, Lancaster.

Buildings. Dated July 30, 1868.

This refers, first, to the construction of buildings in which arches are required. For this purpose, girders stretching from "bay" to "bay," or other such division or compartment, are employed, and from these girders arches are sprung; another part consists in forming the arches of tiles, brick, or similar moulded article, manufactured to the required shape and dimensions in one piece, or in two pieces, with the addition, if desired, of a central portion or key. Another part consists in the use of cast-iron beams and wrought-iron girders. The beams extend across the building, and are supported by the walls, with intervening pillars. Upon these beams, and below their top surface, steps or brackets are formed, for the reception of the ends of the girders, which are then secured to the beams by angle irons.—Patent completed.

then secured to the beams by angle irons.—Patent completed.

2337 A. WATKINS, Covent-garden. Watches. Dated July 30, 1868.

The pillar plate on which the dial is fixed is formed out of a solid piece of metal, curved on the edge, so as to admit of it being fastened into the case, without the use of screws. It has recesses formed or sunk on its under surface into which the barrel and ratchet are placed, whereby the necessity of employing several separate parts to carry the same is avoided. In order to dispense with the use of a chain and fusee and the multiplicity of parts connected with the same, the power is applied directly to the centre wheel by means of a box or barrel containing the main spring. The main spring is tapered, both as to its depth and thickness, with a peculiar tapering on the latter. This is done in order that it may properly free itself and prevent biting in unwinding, whilst the narrow outer end is one-third thinner, in order to give the necessary elasticity. To allow of the spring being wound up and at the same time held in its required position when so wound, without the use of springs to retain it in position, a self-acting click is employed. This click is placed underneath the barrel in a recess or sink in the pillar plate which is provided for the purpose, whereby it is free from any liability of becoming clogged or impeded in its action by dirt. This click is soformed that in winding up it keeps out of gear or free from entering the teeth of the ratchet, and by means of a projection on the inside opposite the part which enters the teeth of the ratchet, and which is touched by the teeth of the ratchet in passing when the winding is finished, the locking end is caused to enter the teeth, and as hold the spring in the proper position.—Patent completed.

2383 C. H. Rockner, Whitchurch, Hants. Paper.

2388 C. H. ROECKNER, Whitchurch, Hants. Paper. Dated July 30, 1868.

Dated July 30, 1868.
This consists, first, in placing an endless cloth under the wirework where the stuff enters upon it, and by this means retaining the water in the stuff when it flows upon the wire. Second, suckers or wipers are placed under the wirework to wipe the water off from its under side. Third, where a dandy roller is used, a sucker inside it is used to take up the water which enters through the roller and discharge it at the end. Fourth, india-rubber is employed to form the surface of the coutch rollers.—Patent abandoned.

Is employed to form the surface of the coutch rollers.—Patont abandoned.

2389 S. C. Lister, York. Weaving face to face. Dated July 30, 1868.

According to this invention, the silk yarn of which the pile is composed is so prepared that the knife which severs the pile shall break, or partially break, asunder the silk instead of cutting it cleanly, and so leave the surface of the pile uneven, and although this unevenness is quite imperceptible, yet the richness of colours of ordinary hand-cut velvet will result from it. In addition to thus preparing the silk yarn or "schappe," it is also required to remove from it any matter that may blunt or wear the edge of the knife, that is to say, that the silk yarn or schappe after being dyed should not contain anything else than the colouring matter, and that all extraneous matter shall have been completely purged out from it, especially greasy or incidulous matter, for both of these act to blunt or wear the edge of the knife, a bath of muriatic acid. of a strength of about 8deg., is made. The yarn is first passed through a bath of pure water with the object of wetting it evenly, after which it is wrung; it is then placed in the acid bath and left submerged for a time, varying with the temperature and with the fineness of the yarn, and also with the dyeing process, to which it has afterwards to be subjected to.—Patent completed.

has afterwards to be subjected to.—Patent completed.

2390 T. H. ROBERTS and B. C. CROSS, Plymouth.

Stopping carriages. Dated July 30, 1868.

The patentees fix each brake block to one end of a short lever, the opposite end of which is pin jointed to the bar. Stops are fixed to the bar to prevent the blocks descending below the bar, so that if the carriage is moving forwards and the blocks are applied to the wheels, by reason of the speed of the horses being reduced, the blocks are drawn downwards against these steps, but if the carriage be at rest, and the horses are backed, the brake blocks will by the back rotation of the wheels be lifted up away from the stops, and thus the wheels will be left at liberty to turn freely. Stops are also applied to prevent the brake blocks from being too much raised, and also to prevent the brake bar from moving too far back when backing the carriage.—Patent completed.

2391 G. DAVIES, Lincoln's Inn. Printing plates. Dated

2391 G. DAVIES, Lincoln's Inn. Printing plates. Dated

July 30, 1868.
A positive or negative of the object desired to be reproduced (whether a picture, landscape portrait, or other subject) is to be obtained in any known manner. The next process is to place behind this positive or negative a sheet of glass, either ground, lined, or otherwise marked



with any design, or wire gauze, woven fabric, or other substance capable of giving by transmitted light the appearance of hatching or grains, square or round stippling, or other desired effect: a photographic proof is taken therefrom by transmitted light, or the photograph of the grain or hatching may be taken first, and then placed behind the photographic plate to be reproduced. When the photographic proof of the subject, with the hatched or stippled effect, has been obtained, a very thin coating of bichromatized gelatine is to be poured carefully over the surface to impregnate the collodion therewith. After desiccation it is exposed to light, and then immersed in water. The image or picture is represented by reliefs and depressions. A cast can then be taken in metal, which can be used for printing.—Patent abandoned.

2392 G. DAVIES, Lincoln's Inn. Electric battery. Dated 30, 1868

July 30, 1868.

This consists in an arrangement of metallic bars of dissimilar metals so arranged together as to constitute a very compact yet powerful and constant pile, without cloths or any other porous substance essential in the construction of the voltaic pile, and without caustic acids, as employed in galvanic batteries. The several bars are made of two or more metals, and fixed in a regular alternating series, as, for example, one bar of zinc or zinc magnesium is soldered at its ends to the next bar as its fellow, which bar may be of copper, brass, or yellow metal, and then this pair is insulated from the next pair by rubber, glass, or gutta-percha, and so on through the whole series contained in the battery frame holder.—Patent completed. Patent completed.

2393 J. Duguid, Glasgow. Dressing flour. Dated July 30

1868.
This consists in covering the drum of the machine, in which the flour is finished or dressed, with wire gauze, instead of with silk, as hitherto, whereby economy at first cost and durability of the dressing material or fabric are obtained. The wire gauze may be attached to the drum in the same manner as the silk is at present, or it may be stitched, nailed, or affixed thereto in any other convenient manner, and is used in exactly the same way as the silk at the same time obviating the necessity of internal machinery for the forcing or brushing through of the flour.—Patent completed.

Patent completed.

2394 J. RAWSTHORN, Preston. Dressing millstones. Dated July 30, 1868.

This consists in using a hollow cap or post secured by a boit or otherwise in the centre of the stone to be dressed, and above its surface, and in mounting upon this centre post a bed or frame, which, while resting upon the surface of the stone, can be turned round the post as a centre, and can be secured to the post in any required position. In the bed or frame a horizontal slide is arranged to slide in the direction in which the cuts have to be made in the face of the stone. This slide is moved by a screw, so that the cuttung tool can be advanced after each cut, the cuts are made parallel to each other. Upon end of the horizontal slide a way is formed in a direction at a right angle to the first-named slide (the two parts forming a T), and upon this slide way, the face of which is vertical, a second horizontal slide is mounted which can be moved to and fro by hand in the line in which the cut is to be made. To this second horizontal slide a bracket is fitted to slide vertically, and this slide is adjautable by a screw, to regulate the depth of the cut. The pick or cutter is secured to one end of an arm or spring; the other end is carried by a pin or fulcrum in the bracket and the tail of the spring, or a spring pressing upon the arm is acted upon by an adjusting screw (also carried by the bracket or vertical slide part), which screw regulates the force or elasticity of the blow. The end of the pick arm or lever moves in vertical guides or slides to prevent lateral vibrations, and the plane of its movement is parallel with the line of the cut: it is lifted by a can working upon a stud, fited in the bracket or vertical slide part, or upon a shuft tin a bearing formed therein, which cam acts as a stop to prevent the pick from going too deep. Thus the pick is lifted by the cam, and it is forced down to give the blow by the spring—Patent completed.

2395 J. H. JOHNSON, Lincoln's Inn. Gas flame spreader

2395 J. H. JOHNSON, Lincoln's Inn. Gas fame spreader. Dated July 30, 1868.

This consists of a thin metal plate, which may be made in the form of a yoke or horse-shoe, connected at its ends by a curved cross-piece, and having two curved flexible arms extending at opposite sides from the vertical portions of the plate, which clasp or grip the tip of the burner and retain the plate thereon. The curved or arched portion of the plate is made sharp at its inner edge, and its outer edge has a V-shaped groove formed around it. The plate when applied to the burner is brought to a position directly above the usual slit in the tip, and is so adjusted that when the gas is ignited all, or nearly all, the luminous portion of the flame will be above the upper edge of the plate. As the flame strikes the inclined sides of the plate it is spread or distended while the air passes from below the flame into the V-shaped channel, and through the latter to the centre of the flame, which is thus furnished with such a plentiful supply of oxygen as will ensure a perfect combustion and produce a flame of great brilliancy.—Pattent abandoned.

2396 T. Prosser, New York. Distilling. Dated July 30.

2396 T. PROSSER, New York. Distilling. Dated July 30,

1868.
This applies to the production and condensation of steam This applies to the production and condensation of steam in connection with the steam engine. To alcoholic distillation, as well as to the production of fresh from the sea or other impotable water. Also to the production of salt from brine, and of sugar from syrup, and to other uses. For this purpose, the liquid to be evaporated is contained in a close receiver, in the upper part of which is placed a series of chambers, communicating with each other, and through which a heating medium, as steam, het water, air, or gas, is successively caused to flow, by which evaporation of the liquid in the receiver is effected. The vapour obtained may pass down a tube into a chamber, which may be called a condenser, and thence into another chamber, which may be called a refrigerator, both contained in the receiver, or the vapour obtained may pass away to act as a motive power, and thence be brought book to the condenser and refrigerator for use or re-use as the case may require.—Patent completed.

2397 J. C. HADDAN, Westminster. Cunnon. Dated

vent or touch hole made in the gun itself, or made in a plug or stopper, fitted into the gun, forming in the one case the vent itself, in the other, the plug hole, with the inner end next to the bore of a trumpet-mouthed shape, inner end next to the bore of a trumpet-mouthed shape, which it is believed will prevent, in a great measure, the cracks which so frequently occur round the lower part of the vent or plug hole, and which result in the bursting of the gun. For this purpose, the patentee removes from the gun so much of the edge at the entry or junction of the vent and of the plug hole into the bore of the gun as may be necessary for the purpose, and when the vent is bouched, the plug is made to terminate at a distance, somewhat short of instead of penetrating completely to the bore of the gun.—Patent abandoned.

short of instead of penetrating completely to the bore of the gun.—Patent abandoned.

2398 J. and H. A. Gwynne, Hammersmith. Pumps and condensers. Dated July 30, 1863.

This consists, first, in the construction of centrifugal pumps, by making the impeller without the usual discs or side plates. Second, in order to vary the speed between that of the engine shaft and the centrifugal pump, the frictional wheels are formed with one square or angular-shaped groove, in the one and corresponding projection, upon the other fitting rate the groove, the amount of friction between the wheels being regulated in the following manner:—The wheel with the groove is divided into discs, one of which is provided with a boss on which a thread is cut; when in working order, these discs are separated from one another a short distance, and held in that position by a metal nut; this nut is circular in form, and the periphery is cut into a ratchet wheel; when from any cause it is required to vary the amount of friction between the wheels, the ratchet nut holding these discs is tightened or slackened accordingly; a pawl and catch is attached to one side of the disc to prevent the ratchet increasing. For the purpose of condensing the exhaust steam of an engine, the suction or delivery pipe of the pump is made for a certain portion of its length of thin metal; this length is enclosed within a casing of greater diameter, so that an annular space or chamber forms a condenser for the exhaust steam from the cylinder of the engine, which upon being caused to puss into it is immediately condensed by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface, maintained cold by contact with the cold metallic surface,

2399 W. C. FIDLER, Isle of Wight. Railway rolling stock. Dated July 30, 1868.

Dated July 30, 1868.

This consists of arrangements by which the main frame of a railway carriage is carried upon three independent trucks, each of which has one or more axies and pairs of wheels. The three trucks are so connected together so as to be able to adjust themselves laterally to the curvatures of the rails, the axie of each truck being at the same time maintained in a line, radial to the curve traversed, or nearly so.—Patent completed.

time maintained in a line, radial to the curve traversed, or nearly so.—Patent completed.

2400 C. D. Fox, Spring-gardens. Repairing rails. Dated July 30, 1868.

This invention relates to the manufacture of rails, wings, crossings, points, and other iron, of the permanent way of railways, from old rails, or other iron, to the means of improving and repairing rails, and to the machinery to be employed for such purposes. These results are effected by the use and application of dies on rolls in the form of rings, in order that they may be easily removed and changed to forge rings of different kinds and patterns. When the dies are in hammers, they are be cut into segments and are provided with an ordinary dovetall in order that they may also be changed. In operating on old rails, they are cut into two or more lengths, and made into a faggot or pile for the purpose of making new rails, and a plate of Low Moor iron is added to form the head, the whole being afterwards subjected to the action of rolls capable of rolling on four sides at once, whereby rails are produced without first rolling flats. To repair bruised or broken rails, weights and levers are brought to bear on the rolls, to give the requisite pressure, so as to forge perfectly the bruised or broken part. The rail having been cut to its length by a circular saw, and its ends being the weakest parts, they are to be strengthened with steel or other suitable metal, in order that the fibres of the iron rail shall be prevented from spreading; this is effected by placing them in a die, the exact shape of the rail, such die being in two divisions, so that it may be opened and closed. The point of the rail is heated to a welding heat, and also the steel or other metal, when both being placed in the die, the weld is instantly made by pressure.—Patent completed.

2401 W. T. ROYLE, Manchester. Folding paper, &c. Dated July 31, 1868.

2401 W. T. ROYLE, Manchester. Folding paper, &c. Dated July 31, 1868.

The object of this invention is to fold the paper into the form ready for its being made into pattern cards, and in order to accomplish this the paper must not only be folded backward and forward, but must at the same time be pressed or creased so as to allow it to retain the folds. According to this invention the patents amplices. pressed or creased so as to allow it to retain the folds. According to this invention, the patentee employs two pairs of jaws or clamps, pressing and retaining a length. Between these two pairs of jaws or clamps are blades mounted in a frame, to which a reciprocating motion is imparted. The paper to be folded is wound in a roll and placed upon a creel, the end of the paper passing between rollers and also between the blades. On reciprocating motion being imparted to the blades, it moves against the paper, causes it to be unwound from the roll, and conveys it towards the jaws, the other blade moving out of its way to allow it to approach the jaws which, being opened, permit the paper to be placed between them. The blade then retreats, leaving the fold of paper in the jaws,—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT.

Dated February 9, 1869.

391 W. A. Lyttle, The Grove, Hammersmith. Improvements in the construction and application of those combinations of an insulated electrical conductor with soft from known either as electro-magnetic or magneto-electric apparatus.

392 R., G., and C. W. Phelps, Birmingham. Improvements in infants' and invalids' feeding bottles.

393 G. Rees, Holloway. Improved means of producing designs and devices upon the surface of glass and glazed

July 30, 1868.

The Invention refers to guns without bouched vents, and Improvements in communicating between the passengers with bouched vents, respectively, that is to say, having the

395 J. and G. W. Dennell, Leeds. Improvements in machinery or apparatus for cutting to shape the soles and heels for boots and shoes.

306 J. Wilkinson and W. Scott, Bradford. Improve-

and heels for boots and shoes.

396 J. Wilkinson and W. Scott, Bradford. Improvements in looms for weaving.
397 G. White, Queen-street, City. An improved motive power engine called automotor.
398 W. Mitchell, Stacksteads, Improvements in the manufacture of felt carpeting, and in the machinery of apparatus employed for such manufacture.
399 L. A. C. St. P. de Sincay, Boulevart St. Martin, Paris, Improvements in metallic tiles for roofing purposes,
400 G. Critchley, Liverpool, and H. B. Fox, Oxton, Improvements in rocking chairs and elastic seats applicable to other similar articles.
401 G. F. G. Desvignes, Lower Tulse Hill, Surrey. Improvements in steam boilers.
402 B. F. Sturtevant, Massachusetts, U.S.A. An improvements in steam boilers.
403 J. H. Johnson, Lincoln's Inn-fields. Improvements in apparatus for heating and ventilating.
404 J. H. Johnson, Lincoln's Inn-fields. Improvements in the manufacture of paper,
405 E. J. A. Camere, Boulevart Bonne Nouvelle, Paris, Improvements in apparatus for communicating between the guard, eugine driver, and passengers in railway trains,
407 G. Gros, Boulevart de Strasbourg, Paris, A kind of Oxes self shutting up and permanently kept closed, intended to contain such objects or substances which require to be carefully closed up.
403 W. Hilton, Improvements in looms for

require to be carefully closed up.

403 W. Hilton, Bolton. Improvements in looms for

weaving.
409 J. Crofts, Hunslet-lane, Leeds, Improvements in operating on fibres in machinery for the combing of wool

perating on notes as a recommendation of other fibres.
410 J. Stuart, Ropemakers' fields, Limehouse. Improve-410 J. Stuart, Ropemakers'-fields, Limehouse. Improvements in the separation of wool, hair, silk, and other animal fibres from vegetable fibres in materials composed of mixed fibres.

411 S. Mellor, Park-terrace, Old Ford. Improvements in the construction of pumps for raising and forcing water and other liquids.

412 W. Lever, Union-street, Southwark. Improvements in the manufacture of hats and other similar head coverincs.

ings.
413 S. W. Mulloney, Coventry. An improved manufac-

413 S. W. Mulloney, Coventry. An improved manufacture of surgical bandage.

414 C. T. E. Lascelles, Great Guildford-street, Southwark. Improvements in machine made casks, and in the machinery to be used in making such casks.

415 F. J. Knewstub, St. James'-street, Westminster, Improvements in, and addition to, locks or fastenings for bars, writing, dressing, and other cases.

416 J. F. Bentley, Peterborough. Improvements in filters.

ses. L. Improvements in filters.
417 W. H. Fischer, Manchester. An improved photo-

filters.

417 W. H. Fischer, Manchester. An improved photographing printing process.

418 G. Broadhurst and J. Kershaw, Manchester. Improvements in the manufacture of double texture cloths suitable for card cloth, blankets for calico and other printers, gas bags for railways, and for other purposes.

419 P. Taysen, Leith. Improvements in the manufacture of stearic and oleic acids.

420 J. Clayton, Radeliffe. An improved paste for fixing and brightening aniline and pigment colours in printing on cotton, woollen, silk, or mixef fabrics.

421 J. Greenfield, Down Villa, Park-road, New Wandsworth. Hop-scotch cloths or boards.

422 J. A. F. Suter, Hereford, and T. C. Hinde, Fownhope, near Hereford. Improvements in the production of heat for heating the boilers of marine steam engines, and in the furnaces and apparatus used for that purpose, 423 J. Carter, Birmingham. Improvements in waterclosets.

424 J. E. Billups, Cardiff, W. Cooper, Rotherhithe, G. T. A. Hine, Gloucester-street, Middlessex, and W. Young, Peckham. Improvements in means or apparatus for communication between the passengers, guards, and drivers of railway trains.

426 G. F. Angell Bernard etters, Russell-square. Improvements. Bernard etters.

Dated February 11, 1869.

426 G. F. Ansell, Bernard-street, Russell-square. Improvements in the manufacture of steel and iron.

427 P. J., F. W., and H. G. Smith, Royal Promenade, Queen's-road, Bristol, and A. Pappenberger, Lodge-street, Bristol. Improvements in the construction of pianofortes, 428 G. A. Nowell, Nuneaton. Improvements in lamps, 429 J. Young, Limefield. Improvements in apparatus for measuring the pressure of gases, and the force of aeriform or gaseous currents.

for measuring the pressure of gases, and the force of aeriform or gaseous currents,
430 H. P. Hansen, Leith. Improvements in stoves,
431 C. Thomas, Bristol. Improvements applicable to
harvesters or reaping machines,
432 B. P. Stockman, Abingdon-street, Westminster,
Improvements in meters applicable to measuring water,
433 A. C. Engert, Tabernacle row, Muddlesex, Improvements in the manufacture of plain and ornamental mouldings for picture frames and other uses,

Dated February 12, 1869. 434 H. Edwards, Suple Inn, Holborn. An improved

preserved food. 435 W. J. Horton, Warrington. Certain improvements

439 W. J. Infood, viscosing and in railway chairs.
436 T. A. Collinson, Liverpool. Improvements in, and in the manufacture of, buttoned and other like boots.
437 F. J. Vandenvinne, Brussels. An improvement in the mode and application for working his patented machine or plough for clearing or grubbing up uncultivated band.

438 W. H. Hayhurst, Blackburn. Improvements in

438 W. H. Haynurst, Diacabuta. Improvements boms for weaving.
439 H. B. Binko, Cleveland-road, Southgate-road, Islington. Improvements in the manufacture and application of indigo, earmine, and other colouring matters and bleaching agents.
440 T. V. Trow, Stratford. Improvements in screw provellers.

pellers.
441 G. H. Morgan, Edgware-road, Middlesex. Improvements in carriages.
442 W. E. Newton, Chancery-lane. Improvements in

the manufacture of explosive compounds.

443 A. V. Newton, Chancery-lane. An improved construction of rotary engine.

414 F. C. Hills, Depttord. Improvements in the fur-

naces of gas retorts, and in means and apparatus for effecting the combustion of fuel in the said furnaces.

445 W. Summers, Bristol. Improvements in packing cases for packing or storing bottles of mineral waters and other bottles.

Detect Exhaustral 10 1000

cases for packing or storing bottles of mineral waters and other bottles.

Dated February 13, 1869.

446 C. Gordon, Goswell-road, Middlesex. Improvements in the construction of breech-loading firearms.

447 A. W. Taylor, Seven Sisters' Lodge, Seven Sisters'-road, Holloway. An entirely new and original method of ceilling walking and performing thereon, by which means the use of suckers, rings, loops, and corded knots are completely dispensed with, and at the same time preventing either an accident or risk of life to the performer.

448 J. Holmes, Northampton. An improved sash holder, by means of which the sash may be held in any required position without the aid of sash lines, weights, or pulleys, or such like contrivances.

449 W. E. Newton, Chancery-lane. Improved apparatus for heating, applicable to generating steam, cooking food, and heating for various other domestic purposes.

450 D. Hanton, Lunan, Forfarshire. Improvements in ploughs.

450 D. Hanton, Lunan, Forfarshire. Improvements in ploughs.
451 E. G. Brewer, Chancery-lane. Improvements in the method of, and apparatus for, constructing and forming metallic joints or seams of tin or other sheet metal.
452 S. W. Campain, Deeping St. Nicholas, Spalding, Improvements in drills for sowing seed and manure.
453 W. Basford, Burslem. Improvements in the manufacture of bricks and tiles.

Dated February 15, 1869.
454 W. Haycock and W. Carter, Manchester. Improvements in horseshoes.

ments in horseshoes.

455 B. Hunt, Serle-street, Lincoln's Inn. Improvements

in saws.

456 A. Mortón, Glasgow. Improvements in the lateral action or induction of fluids, and in the apparatus or mechanism employed therefor, known as Morton's ejector condenser.

457 W. H. Taylor, Southampton-buildings, Chancerylane. An improved combined harness buckle and loop.

458 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in mechanism for changing shuttles and shuttle boxes in looms for weaving.

459 E. J. Hill, Victoria Station, Pimlico, and R. Davis, Craven-street, Strand. Au improved signalling apparatus used in hand signal lamps.

Craven-street, Strand. An used in hand signal lamps.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Gaze	
3040 E. T. Bellhouse and	
W. J. Dorning	3140 J. Shanks
3047 R. Ramsay	3141 L. Clozel
3048 T. Garnett	3145 J. G. Jones
3052 J. Jeffreys	3159 E. Peyton
3053 C. Eskrett	3162 R. M. Wood
3054 F. P. Warren	3169 W. C. Church
3055 J. H. Johnson	3194 W. R. Lake
3059 R. T. Monteith	3199 J. Elce
3060 E. T. Hughes	3210 J. F. Brinjes
3061 W. Rossetter	3211 J. H. Johnson
3062 J. Wood and J. Arun-	3216 J. Stafford
dale	3237 A. B. Berard
3067 W. Estor and C. T.	3328 B. Dickinson
Pearce	3469 C. K. Bradford
3072 J. Chaudron	3486 W. Low and G.
3074 J. M.F. Gray	Thomas
3075 E. J. Hughes	3510 W. T. Bassett
3094 H. A. Bonneville	3798 J. Thomas
3097 T. W. Dyer	19 W. A. Biddell and J.
3100 E. Evans	Redgrave
3106 W. T. Read	45 G. Eveleigh
3107 B. Walker and J. F.	197 G. D. Kittoe and P.
A. Pflaum	Brotherhood
3111 F. Barnett	162 G. Brown
3116 W. H. St. Aubin and	195 C. J. Chubb
B. Benton	204 J. Wilkins
3118 F. W. Hart	236 C. L. Wood and J.
3119 N. Smith	Stockley
3124 S. Leoni	285 A. M. Clark
3128 T. F. Cashin	326 J. G. Willans

# LIST OF SEALED PATENTS.

Sealed	February 12,	1869.
Nelson	2575	J. G. Tong
Manintagh		T Tamdles

2544 G. Nelson	2575 J. G. Tongue
2547 J. Macintosh	2580 J. Landless
2551 R. Robinson and G.	2582 L. Gay
D. Edmeston	2586 J. H. Atterbury
2554 H. Y. D. Scott	2593 W. J. Almond
2558 W. B. Lspeut	2671 R. Saunders
2559 W. J. Hinde	2687 T. Lester and
2560 A. Smith	Trueman
2568 G. F. Bradbury and	2688 J. Fieldhouse
T. Chadwick	2722 E. L. Parker
2572 H. J. Behrens and E.	3415 J. Hickisson
Dart	3594 J. Bourne

Sealed Febru	ary 16, 1869.
2577 J. S. Starnes	2644 J. H. Johnson
2578 P. R. and W. Hodge	2645 A. M. Clark
2583 W. Thomson	2651 W. Hall
2594 J. Sawyer	2686 J. Greenwood
2598 A. Rollason	2696 J. C. Martin
2602 T. Haigh	2733 W. E. Newton
2607 F. J. Knewstub	2750 U. A. Masselon
2609 J. L. Clark	2768 E. Cottam
2611 D. Evans	2780 A. V. Newton
2615 W. J. and C. A.	2782 G. Davies
Kesselmeyer	2798 B. Dobson and W.
2623 W. Chorlton	Slater
2625 G. Tidcombe	2808 G. Bower and W.
2629 O. C. Setchell	Hollinshead
2642 J. J. Long	3149 W. Lorberg
2643 J. Gillott and P.	3377 M. A. F. Mennons
Copley	3757 W. G. Manwaring

# PATENTS ON WHICH THE STAMP DUTY OF £100

HAS BEE	N PAID.
361 J. J. M'Comb 384 T. Davison	392 E. Green and J. New- man
390 E. E. Allen and J. Stewart	472 J. Kirkwood 537 J. Tangye
408 C Torner and J. Shaw	786 W Barford

# PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID. 424 J. and H. Charlton 433 W. F. Cooke and G. Hunter 434 C. D. Abel 445 W. Young 455 J. Vero 457 W. R. Lake 463 F. R. Wheeldon 473 H. E. Newton 475 W. N. Wilson 475 T. Adams and G. J. Beckett 699 G. T. Bousfield 1853 R. Clough and P. Smith

479 T	. Adar Parson	ns and	G. J.	100		mith				
PROVIS Has be		inted u	pon Sp		tions b		MONTH: the fol-	100		
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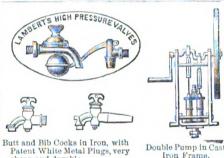
OF SPECIFICATIONS PUBLISHED, For the week ending February 13, 1869.

267 269 271

286 287 288

No.	Pr.		No.	Pr.		No.	Pr.		No.	F	Pr.		No.		r.	No.	Pr.	
	8.	d		S.	d.		8.	d.		8.	d.			8.	d.		8.	d.
1702	1	0	2011	2	10	2056	0		2102			21	44	0	6	2163	0	4
1931	2	0	2012	0	8	2057	0	- 6	2104	0	4	21	45	3	10	2166	0	6
1936	0	4	2015	0	6	2060	1		2121			21	47	0	4	2167	0	4
1943	0	8	2018	0	6	2061	1	2	2123	0	10	21	49	0	4	2169	0	4
1947	0	6	2020	0	10	2064	0	10	2126	0,	8	21	50	0	4	2173	0	10
1962	0	6	2022	0	8	2067	0	4	2130	0	8	21	51	0	4	2174	0	4
1982	0	10	2027	0		2074			2131	0	6	21	53	0	4	2175	0	4
1983	0	8	2036	0	4	2078	0	6	2134	Θ	4	21	55	0	4	2178	0	4
1984	1	4	2037	0	10	2084	1	8	2136	0	4	21	56	0	8	2180	0	4
1993	0	10	2038	2	4	2085	0	8	2137	0	4	21	57	0	4	2186	0	6
2001	1	4	2043	1	0	2086	0	10	2138	0	4	21	59	0	4	2187	0	4
2002	0	10	2044	0	10	2091	0	10	2140	0	8	21	60	0	4	2188	0	4
2006	0	8	2049	0	10	2094	0	8	2141	0	4	21	61	0	4	2191	0	4
2008	2	2	2055	0	10	2098	0	10	2142	0	4	21	62	0	4	2262	0	4

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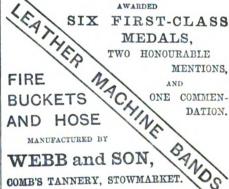
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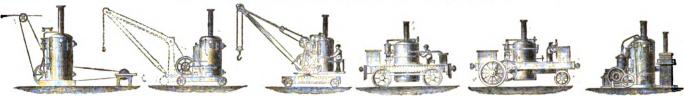
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6 to 27 Horse Power. Winding, Cooking, & Distilling
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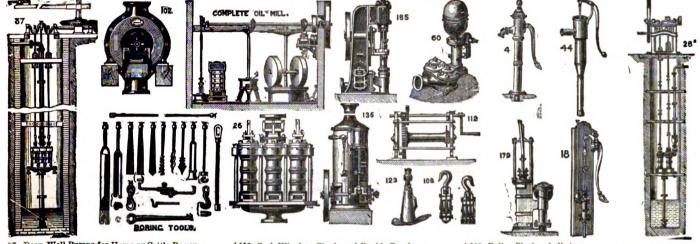
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  28A. Deep Well Pumps or Hand Power.
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THE

# MECHANICS' MAGAZINE.

LONDON: FRIDAY, FEBRUARY 26, 1869.

RECOVERY OF SODA VERSUS RIVER POLLUTION.

ROR several years past the question of river pollution has been a source of considerable trouble to the paper trade gene-The enormous increase of waste lyes, highly charged with chemicals and colouring matter, since the general adoption of esparto grass and the consequent proportionate increase of pollution, as the readiest means of disposing of such waste lyes, has in many localities led to serious and costly litigation. The results have invariably proved adverse to the paper manufacturers, who have been compelled to adopt means for keeping the waste lyes, resulting from the boiling of this fibre, out of the streams. Naturally, these means, so long as they have no other object than to prevent pollution-no matter at what trouble and pecuniary sacrifice to the manufacturers-are looked upon as foreign to the trade and as a necessary evil accompanying the employment of esparto. Hence, very little or no attention is given to the process. The whole thing was and is disliked, and as long as this state of things continues, as long as no other but a negative result is to be attained, nothing else can be expected.

The matter, however, assumes a different aspect when the manufacturers can be convinced that this nuisance may be converted into a source of considerable profit; that, quite apart from the question of pollution, the recovery of the soda from the waste lyes is a commercial and manufacturing necessity, not foreign to the manufacture of paper, but closely allied and essential to it, especially so in the present state of the paper trade. More than one proof that this can be done by adopting proper and efficient means, has been put into the hands of the paper trade, in the shape of various methods of and suggestions for recovering the soda, and for making this recovery process a source of profit. Scarcely any method can fail in causing some profit to be made, when carried out and conducted with an ordinary amount of care. The only question is, which of the various processes suggested is the most rational and practical, and will yield the largest nett profit, without giving offence in other respects? We will giving offence in other respects? pass over the numerous ingenious proposals which have been made, but which have entirely failed, when put to the practical test, and confine ourselves to discuss briefly those methods, the main principle of which may be regarded as correct.

This main principle is throughout the same as that which has been followed for a number of years in the recovery of soda from similar waste lyes at bleach works, and also in mills where straw is extensively used in the manufacture of paper. It is simply evaporation and incineration, and the degree of success depends upon the quality of the fuel employed and upon the construction of the apparatus. The fuel must of necessity depend upon price and local circumstances. We therefore merely mention that, if obtainable, the socalled small, slack or dross from a good coking coal, such as the Durham coal, and that from the Wigan district, is the most suitable for the purpose. The old system of recovery is to heat a hearth or roaster (an ordinary reverberatory furnace with a dished bed for holding the waste lyes) by a strong fire, and

positions. The waste lyes are run or pumped into the concentrating pan or pans, whence they pass into the hearth or roaster. Here they are evaporated down to a solid burning mass, and this is withdrawn into barrows, to be operated upon in some separate calcining furnace, or to be left to burn itself in a heap, either in the open air or in some sort of vaulted chamber or kiln. The soda recovered by this system fuses together in the heap to a solid rock, which requires to be broken up with heavy hammers and steel wedges, and, as we have witnessed in one or two mills, is further reduced by Blake's stone breaker, being finally ground in a mill. quality of the product leaves nothing to be desired, and its action, in the form of caustic solution, is as strong as that from fresh soda.

On carefully examining the system, we find, however, several serious faults (assuming that otherwise the construction of the fire and the hearth be correct) which will be patent even to those not conversant with such processes. In the first place, there is the obnoxious smell which is given off by the mass, when withdrawn from the hearth or roaster, and which is due to imperfect and interrupted combustion of the resinous and gummy matters contained in the waste lyes. Second, there is the amount of manual or mechanical labour required to reduce the recovered soda rock to a state fit for lixivia-tion. Third, there is an objection to the application of the waste heat from the hearth or roaster to the surface of the weaker waste lyes in the concentrating pans. The hearth itself is, with the exception of the short time, when the mass is becoming solid, nothing else but an evaporating furnace. The flame is at its greatest heat on entering the hearth at the firebridge. In passing over the boiling lyes it becomes saturated with steam; in proportion to the distance from the fire-bridge the heat decreases, and with it the faculty to take up or hold steam, so that, if the series of concentrating pans heated by this moist waste heat were sufficiently long, the entire quantity of steam raised in the hearth or roaster would be condensed again in those concentrating pans. Fourth, if the solid and burning mass is kept longer in the hearth than otherwise required, either for the purpose of reducing the stench by giving more time, and so to ensure a more perfect combustion of the obnoxious gases, or for the purpose of getting more evapora-tion in the pans, it is done at the expense of fuel, time, and labour. Fifth, and lastly, there is a drawback in the very considerable resinous and gummy sediment which forms in a very short time in concentrating pans heated by surface heat, and which is owing to the lower portions of the lyes in them being nearly cold.

Though we acknowledge the soundness of the principle of surface evaporation for these waste lyes, we consider that in this old system it has been carried to an extreme, and that the results cannot be as favourable as those produced by the system of construction which has been patented by Mr. C. Seitz, of Broomieknowe, Lasswade, N.B., in which system we find a judicious combination of surface and bottom heat. There is great danger of burning the plates in applying bottom heat to wrought-iron pans, containing, as in the case under consideration, lyes liable to form pasty or solid sediments. If, however, due care is taken that the plates are not exposed to any dry heat or flame, but that steam is always present, no such danger exists, as we then have really nothing else but superheated steam. The principles of this new system, which, we understand, has been carried out at several paper mills with complete success, are,-first, to carry the waste heat from the hearth or roaster, saturated as it is with steam, through an open concentrating pan, by means of segmental flues, passing away to to pass the waste heat over a concentrating pan or a series of pans, placed in various pan and then into the chimney. By this tion.

means, every trace of heat is effectually used for evaporation. Second, to place a reverberatory furnace in such a position that its bed directly communicates with the hearth or roaster by means of an opening. This furnace carries two concentrating pans above its arch, so constructed that they are supported independently of the brickwork, and, in case of repairs, the entire furnace may be taken down and rebuilt without disturbing the two pans.

The furnace is used for manufacturing soda from saltcake or sulphate of soda, in quantity just sufficient to make up the deficiency between the weight of soda recovered and the weight of soda required for boiling the grass. This deficiency varies from 15 to 35 per cent., owing to the unavoidable loss arising from cooling and washing the boiled fibres. quantity of soda required to supplement the deficiency does not keep this furnace fully employed, and during this spare time it is used in connection with the hearth or roaster in the following way:—When the liquid mass in the hearth becomes pasty, and just begins to burn, it is moved through the opening before referred to into the furnace, and is here well worked and turned over, under a low heat, so that every part is thoroughly exposed to the action of the air, which enters through the firebars and door. Thus perfect combustion is insured, and no obnoxious gas -the product of imperfect and interrupted combustion-is allowed to escape unburnt. When the whole mass is at a uniform dull red heat, it is withdrawn for further treatment, The product is a darkish grey powder, as readily soluble as ordinary alkali or soda ash, and contains on an average 44 per cent. of By removing the mass out of the hearth in a yet unforward state, for further treatment by waste heat in the furnace, the hearth is at once at liberty again, for its proper object, evaporation; and thus time, fuel, and labour, are saved, besides avoiding every possibility of bad smell.

Third, the waste heat from this auxiliary furnace, as it may be termed-whether from the manufacture of soda, or from the burning of the recovered soda—is dry, that is to say, it contains no steam, and, therefore, is passed over the waste lyes in the pan immediately above the arch. Here it saturates itself with steam from the under pan, at the same time heating the bottom of the open top pan with moist heat. Fourth, any heat that may still be left after passing between the two pans above the auxiliary furnace is, previous to passing away to the chimney, conducted, together with the waste heat from the hearth or roaster, through the same concentrating pan as referred to under the first head, or through an additional pan of similar construction.

Having described the system, we will now draw attention to the advantages which are found by Mr. Seitz to result from its practical application. In the first place, the amount of fuel, in proportion to a certain bulk of waste lyes or a certain weight of ash recovered, is reduced to a minimum, and every practical heating effect from it is utilized. Next, the working capacity of the plant (furnaces and pans) is exhausted to the fullest extent. Every possibility of bad smell is avoided, and the ash recovered is readily soluble without further treatment, and yields a clear bright solution.

Lastly, leaving the profit of the self manufacture of the deficient quantity of soda out of the question, the waste heat from this part of the process gives a large increase of evaporating power at no expense.

We have gone more fully into the subject than we intended, but the question is of such importance to the paper trade generally that we could not refrain from ventilating the various points on all sides; and now leave the matter in the hands of the paper manufacturers for their serious considera-

# MANUFACTURE OF CAPS AND CARTRIDGES.

No. IV.

HAVING described the manufacture of the external portions of the caps and cartridges, we have now to direct our attention to their actual contents, or what constitutes their peculiarly deadly and destructive properties. We commence with the contents of the caps, consisting of a fulminating preparation. This compound has for its base or principal ingredient the well-known substance fulminate of mercury, usually prepared in the laboratory by the action of nitrate of mercury upon spirits of wine. The reaction gives rise to the compound in question, which is chemically a combination of the protoxide of mercury with cyanogen, and is represented by the formula Hg O, Cy O. During the process, the gases, which are principally of the nitrous and nitric acid type, are condensed, and are given by the formula C 4 H 5 O, NO 3, and C 4 H 5 O NO 5. The chemical formula for pure alcohol is C 4 H 6 O 2, or C 4 H 5 O + HO, and can be evidently deduced from the above by merely substituting one atom of water, or HO, for the nitrous and nitric acids respectively. If instead of NO 3 and NO 5 in the formula for the gases, we write Ho, we arrive at once at the conclusion stated. the establishment of M. Gevelot, the manufacture of this dangerous but necessary compound is carried on during the space of eight days in each month, which is sufficient to supply the workshops for about thirty days, and at the same time maintain a small stock in hand. The preparation of the full minate is thus conducted. Into each of twelve large glass retorts is poured exactly seven pints of nitric acid, NO<sup>5</sup>, to which is added 2.34lb. of pure quicksilver. The retorts are then placed in a small open furnace, and in a short time vapours of hyponitric acid gas commence to "come over." At the end of three-quarters of an hour, the combination of the metal and acid is effected, and its solution complete. The retorts are removed from the furnace, placed upon suitable supports, and another dozen filled with similar materials substituted in their stead. Near to the workshop where this subliming process is executed, are arranged in the open air a series of twentyfive large globular-shaped glass vessels, carefully closed by tightly-fitting corks. Through these corks are passed a number of bent glass tubes, the other extremity of which is attached to one end of an earthenware pipe. The other end of this pipe receives another tube, not of glass, but of pottery ware, which communicates with a large earthenware jar. By means of analogous tubes, this jar is connected with three others, the relative sizes of which are in diminuendo. Into these glass bottles are poured 5.28 pints of the best commercial spirits of wine, entirely free from all essential oil, and carburet of hydrogen. This quantity is immediately supplemented by an addition of the solution of nitrate of mercury, already prepared in the retorts, in the proportion of the contents of one retort for two and a-half bottles. a very short time after these two ingredients are brought into contact, the chemical action commences with vigour. Ebullition sets in, and the bottles are filled with whitish fumes, which pass away by the bent glass pipes, traverse the whole series of pipes and jars already described, and finally escape into the open air by means of the pipe inserted in the smallest and last of them. After a short interval, the white fumes cease and are replaced by the red colored vapours of hyponitric acid gas. At this juncture, another dose of alcohol is added to the contents of the bottles, and the action permitted to continue for another hour or so. No sooner is the necessary time calculated to have elapsed than the

a rapid movement of rotation, cause the precipitated fulminate of mercury to sink to the bottom in the form of a greyish deposit. It is subsequently poured out into the first of three wooden troughs, connected by glass syphon tubes. There it is thoroughly washed to remove every trace of free acid, transferred into another trough and mixed with a certain proportion of nitre, thus completing its com-position as fulminating or detonating powder. In all chemical operations there are invariably a number of waste or bye products produced which are of no real use to the result in question, but, nevertheless, the result could not be obtained without giving rise to them. It is scarcely necessary to remark that endeavours are always made to utilize these products, and not permit them to pass away into the air and become utterly wasted. Let us now ascertain what becomes of the white and red fumes that pass into the pipes and condensers connected with the whole arrangement of the apparatus. Naturally, the gases become condensed in their various receptacles, and a liquid is formed, composed of alcohol ether, and acid. The greater portion of the acid is found in the first condensing jar, while the last generally contains only ether. These bye products are treated with chalk, to remove the nitric acid also carried over with them, and by the addition of an atom of water in the place of the removed acid, reconverted into alcohol, as explained in the formula above. After undergoing the process of distillation, the alcohol is rendered sufficiently pure to be used again in the preparation of the fulminate. As a rule, this is the description of alcohol that constitutes the second addition to the bottles after the escape of the red fumes have commenced, and a double advantage is thereby gained. Not only is the operation of reconversion a cheaper method of obtaining a supply than purchasing it in the market, but the very heavy duty imposed upon the article is avoided, which is at the rate of £28 for every hogshead passing the barrier of Moulineaux. It must not be imagined that M. Gevelot was permitted to enjoy the reward of his chemical skill and assiduity without a little disagreement taking place between him and the inland revenue officers. The authorities contended that in order to deprive alcohol of its liability to a duty, it should be adulterated with some foreign substance, that would render it unsuitable for the purpose of drinking, and, in furtherance of this view, recommended that it should be mixed with a fourteenth part of vinegar, or the essence of terebenthine, or spirit of camphor. Against these propositions, M. Gevelot argued as follows:—He maintained that as the alcohol was required purely as a chemical agent, in the preparation of the fulminating powder, it could not possibly be mixed or adulterated with any foreign substances or solutions, of any description whatever, and that, moreover, as it was not intended to be used as a beverage, it was contrary to the spirit of the law to press upon him a claim for duty. Latterly, M. Gevelot offered to add from two to three per cent. of nitric ether to the alcohol, if he were permitted to use it in his manufacturing operations, but at present no good has ensued from the offer, and the duty is levied as usual.

As will be readily anticipated, from the dangerous nature of the material dealt with, the workmen require no injunctions to fulfil all the precautions that may ensure, so far as human foresight and care can do so, their own safety and that of their fellows in other departments, as well as of the premises in general. The dangers they are exposed to are many and various. In the first place, were any of the liquid to come into contact with their flesh, it would create serious and troublesome hyperactures. serious and troublesome burns and ulcers of a sary time calculated to have elapsed than the workmen, with their hands and bodies protected by thick gloves and padding seize the still smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking between the same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them same precaution is smoking bottles, and by imparting to them smoking bottles, and by imparting to the smoking bottles, and the same precaution is smoking bottles, and the same precau

necessary with all the apparatus and utensils employed. The workmen themselves, although they show no external signs of fear, and evince no trace of undue anxiety, yet plainly demonstrate by the care with which they move about, and the delicacy and gentleness of all their various manipulations, that they are fully aware of what might be the consequence of an ill-judged manœuvre or awkwardness. The entire court or yard where the fulminating compound is prepared, is surrounded by a high wall, built of roughly quarried stones. There is no need for us to comment upon the fearful violence and the terrible effects that follow an explosion of any fulminate. In the premises under notice, the most minute pre-cautions are taken to avoid all chance of such a catastrophe, and also to limit its effects to a circle as narrow as possible, should it ever unfortunately occur. We may now regard the manufacture of the fulminating compound to be complete in the bulk, but there are a large number of secondary operations and manipulations that it has to be submitted to, which are of a nature nearly as dangerous as those already described. All these subsequent processes are carried on in little sheds or cottages, separated from the rest of the premises by strong partition walls of earth and stone, nearly 20ft. in thickness, and, as a further protection, each shed is separated from its neighbour by a nearly similar barrier, so that the subdivision or isolation of the dangerous material is amply secured. These, however, are not the only precautions taken to ward off all risk of an explosion. The ground in the vicinity where the workmen are employed in transporting the fulminate from one place to another, is laid with a per fectly even coat of asphalte or bitumen, so as not to present the slightest roughness or asperity, in the event of any of the explosive compound chancing to fall upon it. The tables upon which it is manipulated are covered with felt, and the legs also rest upon small pedestals, composed of the same material. All the workmen are strictly forbidden to wear any but list shoes, and every utensil and implement used in the minor operations of manufacture are round in form, and have, in fact, no edges. Silence, together with easy gentle movements, upon the part of the operatives, characterizes the whole of their proceedings. A glance is quite sufficient to indicate to the most careless observer that the men are engaged in work of no ordinary nature. Their whole mien and bearing is ample evidence that they are perfectly well aware of the consequence of any indiscretion upon their part. In our next, we shall proceed to describe the manufacture of the fulminating powder constituting the explosive element in caps and cartridges, in which, it has been already stated, the fulminate of mercury plays the chief part.

# NOTICES OF BOOKS.

SMALL heap of sundry volumes at our elbow warns us that time has flown since our last batch of books was despatched, and has permitted another literary accumulation to place us under another obligation to publishers and public. This obligation we now propose to discharge by proceeding to notice the productions in question. And first we will take a new monthly magazine of engineering,\* which has recently been received from America, and which is being brought out by the well-known publishing firm of Van Nostrand and Co. It is conducted by Mr. Van Alexander L. Holley, whose name is well known in connection with a work on Ordnance and Armour. This production, which rejoices in the name of the "Eclectic Engineering Magazine," is a selection from the professional



the ordinary way, by taking whole articles or even portions of them, but by carefully abstracting and digesting them. These abstracts are intended to represent the results of carefully reading a mass of matter, and the object of the work is to save the great body of artizans both time and money in the pursuit of knowledge. The first part came out with the first month of the present year, and its contents lead us to expect it will have a fair run. It fulfils well the part it proposes to take in scientific literature, and will form a useful digest of current engineering practice in America and other countries.

Dr. Lardner's handbooks of natural philosophy are so widely and so well known, that it needs not that we enter into detail respecting the principles of their construction. are everywhere appreciated, and our readers will be glad to learn that a new edition of one of them-that on "Optics," -- has just made its appearance. It has been edited by Mr. Olver Harding, who has kept as closely as possible to the plan of the original treatise. He has introduced such alterations and additions only as were necessary to embody the results of modern investigation, and to bring the work up to the present condition of scientific knowledge. The sections which have undergone the greatest changes are those of the analysis of light, the theories of light, and the application of the undulatory theory to the phenomena of reflection and refraction. To those who desire to attain an accurate knowledge of physical science, without the profound methods of mathematical investigation, we commend this and the other volumes of Dr. Lardner's handbook.

Mr. Burgh has produced a practical treatise on the indicator diagram, which subject he treats very exhaustively. He describes the indicator and its use, and then proceeds to explain the method of taking an indicator diagram correctly. The theoretical geometry of the indicator diagram is then discussed, after which the practical geometry is considered. Indicator diagrams from a number of engines of various classes are given further on, and the little work closes with an explanation of the indicated horse power in connection with the diagram. To sum up in Mr. Burgh's words, "the whole of this is expressed in 164 pages, and illustrated by 100 engravings; so that the entire matter has been fully explained, but not more so than requisite or tiresome." The last eight words convey an impression which must surely be the reverse of what the author intended. However, we will simply say that the sentence is ambiguous, and as Mr. Burgh is much given to ambiguity we will let it pass, observing only that the practical usefulness of his productions is too often marred by the most obscure verbosity. In the present case, with this exception, the work is one which is well worthy of careful study by all who are not familiar with that apparent mystery—the indicator diagram. We have received the Report of the United States Patent Office for the year 1866, from the Commissioner of Patents, at Washington, through the agency of Messrs. Stevens Brothers, of 17, Henrietta-street, Covent-garden, London. This report is comprised in three volumes, the first two containing the text, and the third the illustrations. The report is very comprehensive, and will be found of great utility to all engaged in patent matters in this country. These reports have, hitherto, been somewhat in arrear, but as we received the present volumes only a few months after the reports for 1865, we conclude that in time they will be produced soon after the year to which they refer has closed. This will greatly enhance their value, both in America and other countries. From the Commissioner's

Report, we gather that during the year 1866 there were 15,269 applications for patents, the number issued being 9,450, which included re-issues and designs. There were 2,723 caveats filed, 67 applications for extensions of patents, of which number 58 were extended. The number of patents which expired during the year was 1,042. Of the patents granted, 9,210 were to citizens of the United States, 127 to subjects of Great Britain, 48 to subjects of the French Empire, and 65 to subjects of other foreign governments. The pecuniary position of the office for the year in question was as follows:—495,665,38 dollars were received in fees, the expenditure amounting to 361,724,28 dollars. The amount to the credit of the patent fund on January 1, 1866, was 130,184,78 dollars, which, with the receipts of the year (495,655,38 dollars), gives a total of 625,850,16 dollars. Deducting from this 361,724,28 dollars—the expenditure—leaves 264,125,88 dollars to the credit of the patent fund, on January 1, 1867, the surplus of receipts over expenditure during the year being 133.941.10 dollars. The applications for patents received in 1866 exceeded those of 1865 by nearly 50 per cent., and of 1864 by more than 100 per cent. The number of more than 100 per cent. caveats filed exceeded that of 1865 by nearly 200 per cent. The number of patents issued exceeded that of 1865 by nearly 50 per cent. while that of 1865 exceeded any previous year by more than 30 per cent. The receipts into the patent fund exceeded those of 1865 by more than 42 per cent., while the increase of expenditure was less than 33 per cent.; the receipts of 1865 having exceeded those of any previous year by more than 36 per cent. On the whole, the patent business in America was in a very satisfactory condition at the time of the report, and we believe has since greatly increased. This will have led to enlargements in an already large establishment, to meet the requirements of the department. This is indicated in the Report of the Commissioner, to whom we must give credit for the excellent way in which these reports are turned out, and our thanks for the volumes before us.

Messrs, J. M. Johnson and Sons, of 3 Castle-street, Holborn, have forwarded us a copy of the Report of the Jurors of the Havre volume, which is printed in French and English forms a complete. English, forms a complete history and record of this exhibition, which differed in many respects from those which preceded it. In no previous instances were the various industries, which contribute to the development of maritime progress, so fully represented as at Havre. A novel feature also was the election of the jurors for each class by the suffrages of the exhibitors. official volume before us bears evidence of careful compilation; to ensure accuracy, proofs were submitted to the president and reporter of every class or section. It, therefore, forms a useful book of reference on maritime and commercial affairs, as well as an authentic record of the Havre Exhibi-

That fruitful source of grumbling and frequent irritation, a smoky chimney, has been very copiously dealt with by the Rev. Mr. Ainslie, in a little book just published.

The author treats the subject in a scientific manner, basing his arguments on the well-known laws which govern the ascent of heated air and smoke. He writes from personal experience of the annoyance, and offers the results of his researches into the cause and cure of this evil to the public. Especially do we commend the book to architects and builders, for to their neglect of certain rules necessary to insure a free and regular draught are the public indebted for smoking fires. Of course the right thing is to build the chimney in a proper manner; but if this be not done

in the first instance-and London chimney pots demonstrate how very rarely it is-then comes the question of cure. As smoking fires proceed from various causes so there must be various remedies, and Mr. Ainslie gives numerous causes of the evil, and for each suggests a cure; therefore, those who are pestered with the nuisance in question should consult this book, in which they will not fail to find a remedy let the cause of their fire smoking be what it may. We venture to affirm that Mr. Ainslie will do more practical good by this little treatise in bettering the tempers of those who are afflicted smoky chimneys, than if he had written a sermon double the length upon the faults which have their origin in these irritating nuisances.

We have a batch of small but useful books from Messrs. Cassell, Petter and Galpin, of Belle Sauvage-yard, Ludgate-hill. The first of these is a treatise on orthographic and isometrical projection, the development of surfaces and penetration of solids. It is by Mr. Ellis A. Davidson, and forms one of Cassell's series of technical manuals, of which the first, that on linear drawing, was noticed by us in October last year. The present volume treats of orthographic projection, by means of which objects are projected from given plans, &c., and isometrical projection, by means of which a view of an object is projected at one definite angle, a uniform scale proportionate to the real measurement being retained throughout. The lessons are progressive, and are given in a manner sufficiently simple for all purposes of educa-tion. "Right Lines in their Right Places," is the title of a little treatise by the same author and from the same publishers. teaches the first principles of drawing and design without instruments. This is a novel idea, but it is so well worked out that by following it carefully, children may very easily be taught the rudiments of geometry without the use of any other instruments than a pencil and a sheet of paper. remaining three books from Messrs. Cassell's establishment are also educational, but of the lowest order, in an intellectual sense, being a primary series. They comprise Part I. of a Boys' and Part I. of a Girls' First Reader, and an Explanatory Introduction to Geography. Messrs. Cassell's reputation for works of the foregoing character is so well established that no recommendation from us can add to the value of the books before us, which are in every way fitted for the several purposes for which they are intended. This firm deserves great credit for the good they have effected in rendering education popular.

It is, perhaps, somewhat late to notice annuals, but they were late in reaching us. Of these, three are now before us. is the "Engineers', Architects', and Contractors' Pocket Book," formerly well known as Weale's, but now, and for the last year or two, published by Lockwood and Co., Stationers' Hall Court. The volume for 1869 is, in its general character, much the same as its late predecessors, and contains the usual amount of varied and useful information. The second is an annual which has made its appearance this year for the first time. It is "The Engineers' and Contractors' Office Almanack and Pocket Companion for 1869," and is published by Messrs. Lockwood. It contains memoranda relating to standing orders, railway construction regulation, data and formulæ for wrought-iron girders, steam engines, railways, cranes, roofs, mill-gearing, hydraulics, weight of iron, &c., and has a number of blank leaves for notes and memo-It is a very handy size for the pocket, randa. and will be found very useful.

The third of these annuals is "The Railway, Banking, Mining, Insurance, and Commercial Almanack," which continues to be ably edited by Mr. William Page Smith, and published by Simpkin and Marshall, Stationers' Hall Court. Under the above comprehensive

<sup>\* &</sup>quot;Handbook of Natural Philosophy." By DIONYSIUS LARDNER, D.C.L. "Optics." Sixth thousand. Edited by T. OLVER HARDING, B.A., Lond. London: James Walton, 137, Gower-street. 1869.

<sup>137,</sup> Gower-street. 1869.

"The Indicator Diagram Practically Considered." By N. P. Busen, engineer. London: E. and F. N. Spon, 48, Charing-cross. 1869.

<sup>† &</sup>quot;Smoking Fires, their Cause and Cure." By the Rev. ALEX. COLVIN AINSLES, M.A., London: Longmans. Taunton: F. May. 1869.

title we have one of the most useful almanacks extant, inasmuch as it contains a variety of information on the subjects alluded to as well as the ordinary almanack matter in an extended and interesting form. Mr. Smith gives reviews of the material interests of the United Kingdom for the past year in the form of special articles which possess an interest for all classes of the community.

all classes of the community.

The second volume of "The Percy Anecdotes" has been issued by Mr. J. A. Berger, 13, Catherine-street, Strand, and like the first is a wonderfully cheap production. The present volume comprises a collection of original and select anecdotes of cloquence and patriotism. This series does Mr. Berger credit, and we are sure will prove a great success.

And now that we have cleared off the greater portion of the books on our list, we will relieve our mind of a few ideas which have possessed it for some time past and have been particularly called forth when obliged to stop to cut a thick volume before we could gather its contents. And we cannot better express ourselves than by quoting our contemporary, the "Daily News," on the subject. Says that paper:-" Is it not time that the paper-knife was condemned as obsolete, or classed among the useless ornamental lumber with which our ladies love to load their drawing-rooms? That this is not possible for the reason that books and periodicals are still sold uncut is no slight reproach to the publishing trade, and one which it behoves their customers to bring home. It is the singular conservatism of the members of that trade which makes a paper-knife necessary at all, and we should be glad to know if there be any grounds upon which what seems to be a stupid anachronism can be defended. Why should the onus of completing the mechanical operations which make reading possible be thrown upon those who buy, and why is not cutting the leaves of a book made as much the duty of the binder as sewing them to-gether? It is clear that the act of papercutting can be performed on a large scale at an infinitesimal cost; and that the whole of the uncut books and magazines now issuing from the press are so many encroachments upon the good-nature of the public. For no excuse of difficulty or want of knowledge or of means can be advanced. Too many books and magazines are sent into the world ready for use for any such plea to be received. Still, the example set by Fraser' has been followed by very few of the periodicals; while bulky volumes come before us every day in the year which require an annoving amount of mechanical drudgery to be spent upon them before they are fit for use. are few things more irritating than to be midway in a book of absorbing interest, to have the time as well as the inclination to go on with it, and to be suddenly pulled up for want of any instrument with which to sever its Yet this is happening among us upon leaves. every day in the year. Our booksellers should really condescend to spare us this needless and petty worry, and war to the paper-knife should be the constant cry of every buyer of books." We will only add that they manage these things better in America.

# ELECTRICITY AND TELEGRAPHY.

THE steamer "Investigator," belonging to the Telegraph Construction and Maintenance Company, and having on board the submarine cable for Tasmania, reached the Cape de Verde Island on the 24th ult., all well.

The Submarine Telegraph Company have issued their report, and their meeting has been held. A dividend of 5 per cent. per annum has been declared. Since their previous report, very considerable reductions in the tariff have taken place, and, as is usual in such cases, a very large increase in business has been the consequence: so much so

that during the period of reduction, the amount received for messages has been greater than at any similar period since 1866. The work has been carried on without interruption-a fact due to the number of cables across the Channel owned by the company, but the weather has been such that during the past half-year there were many interruptions at different times to the various cables; so much so, that the cost of repairing them has exceeded the usual amount of £3,000, specially set aside for that purpose. This may be accounted for by the number of cables and the inclement weather causing vessels to drag their anchors and damage the cables, all of which are in anchorage ground; but, on the other hand, we have the satisfaction of knowing that, by reason of the

number of routes, total interruption did not occur. It is very satisfactory to be able to announce the successful recovery of the Cuba and Key West cable, lost during last summer. Sir Charles Bright has at length been successful in not only effecting the recovery of the cable, but in completing the communication between Key West and Havana by this the second cable.

The steamer "New England" (formerly the

"Banshee" of Holyhead and Dublin service), 450 tons, was specially fitted out at New York with the requisite cable machinery. chinery is copied almost entirely from that on board the "Narva," the ship engaged in 1867 in the successful submersion of the first cable. "Narva" was fitted out in 1867 with entirely new machinery, consisting of every requisite, and embracing many novel points, by Mr. F. C. Webb, C.E. In the following year, she was chartered for the second cable, and fitted out precisely in the same manner. On her return to New York, after the loss of the second cable (the one now recovered), careful dimensions of her machinery were taken and drawings made. Similar machinery was made in the autumn and winter, and the "Now England" was fitted out with duplicates of our machinery. Soon after the arrival of Sir Charles Bright at New York, she left for Havana. On the Soon after the arrival of Sir Charles passage she met with very severe weather, and got damaged. The weather was so bad that they had to throw coals overboard. After repairing damages, the work of recovering the cable was trainings, the work is recovering the carlie was much interfered with by the state of the weather. The weather in the Gulf Stream is unlike anywhere else. However smooth and calm it may be, in a few minutes a violent wind will arise, and render any operations for telegraph work im-possible. This may last for a few hours only, possible. This may last for a few hours only, but sufficiently long to mar a day's work. Unfortunately, such weather is almost of daily occurrence, and it is matter of congratulation that the work of recovering the cable has been completed so soon, especially when we consider the disadvantage of weather—grappling in the Gulf Stream, in a four knot current, for a cable resting on an uneven bottom, at about the depth of a mile. However, the cable has at length been recovered, and the communication restored by laying a new piece from the splice to the shore, although not, as originally intended, to the landing place of the '67 cable, which, we are glad to find, is in admirable working order.

The directors of the Indo-European Telegraph Company have issued a report showing most satisfactory progress throughout the great length of their line, and there is every hope of this means of communicating with India being completed by the end of the year. The submarine cable for the Black Sea is in course of manufacture, and will probably be submerged in June or July next.

M. Geissler, of Bonn, so well known for the electric fluorescent vacuum tubes, has lately succeeded in making tubes so that they become luminous by simple friction. A straight tube is formed into a spiral, and placed within a larger tube, to which it is united, and a vacuum is made in the inner tube only. On rubbing the outer tube—the effect is greater by the use of a cat's skin as a rubber—the inner tube becomes luminous, and of a colour corresponding to the gas filling it. The tubes formerly used generally required a Ruhmkorff coil of some size te give any really good luminosity, but we learn that with the new kind of tube, some have been constructed sufficiently large to illumine places totally obscure.

siderable reductions in the tariff have taken place, and, as is usual in such cases, a very large increase in business has been the consequence; so much so, niat, of Paris, in which they produced so great a hydrofluoric acid. Many of our readers who

vacuum that the electric spark could not pass. M.C. Schultz has lately been experimenting on this subject, and the results of his experiments go further. He states that the passage of a spark across rarefied air depends upon the tension of the spark. For instance, he established a vacuum in a Goissler tube, by means of a Geissler pump, so great, that a current from a Ruhmkorff coil would not pass, but by increasing the intensity of the primary current, the secondary current reappeared in the tube. A further vacuum was obtained so great, that the secondary current and its effect disappeared. This vacuum was, however, surmounted by sparks from a Holtz machine.

Some recent experiments upon magnetism have been communicated to the French Academy by M. Tréves. As there is an intimate relation between electricity and magnetism, and as electromagnetism was made use of in the experiment, we mention it for the information of our electrical readers, the object of the experiment being to see whether magnetism had any effect upon the cast-ing of iron. Two small moulds were made for the receiving of equal quantities of precisely similar molten iron, but under different conditions; the one was placed so as to be entirely removed from any magnetic influence, whilst the other was placed in a strong magnetic fluid; in fact, in the axis of a powerful electro-magnet, actuated by twelve Bunsen's elements. The moulds were filled with the molten liquid, and the electro-magnet exerted its influence, on the cooling of the metals; the two moulds were broken up, and on a careful analysis by a competent person, no difference in their crystallization was perceived, but an important fact was observed in the experiment, that a powerful magnetization of the casting was indubitably observed from its liquid state to its cool condition. After its thoroughly cooling, and had become solid, this magnetism remained, but in a less powerful condition; it was then a feeble magnet, but undoubtedly a magnet possessing two poles. It has been proved, years ago, that a magnet subjected to great temperature will lose its magnetism; but the present experiment would show that iron would remain magnetic at all temperatures, so long as the exciting cause continues. In 1865, M. Fave tried a somewhat analogous experiment; he dissolved in acid some soft iron, and coated it by galvanoplastic method, in a fine layer, on the surface of a plate of copper, and magnetized it. He proved that by applying heat to the iron (chemically pure), so great as to almost fuse the copper, that the coercitive force was so great, that the magnetism still remained, and remains up to the present.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

A CHEAP NICOL'S PRISM—PROCESS FOR COPTING OLD AND BARELY LEGIBLE WRITING—ANHYDROUS HYDROFLUORIC ACID—CEMENT FOR RETAINING VERY VOLATILE LIQUIDS,

THE Nicol's prisms, which our readers will have seen mentioned so often in the recent papers of Professor Tyndall, are expensive to obtain of any size. They are made of a crystal of calcspar, cut across diagonally, the two sections being afterwards joined together by means of Canada balsam. It has recently been discovered that a prism, possessing the same optical properties, may be made by constructing a vessel of glass, and inserting a thin plate of calc-spar across the diagonal, the vessel being filled up with bisulphide of carbon. If this be so, Nicol's prisms of considerable size may be made cheaply, since blocks of calc-spar of considerable size are often met with.

M. Niepce St. Victor gives a process for copying very old writings, which may be useful, if successful. Ordinary copying paper is to be used, but, instead of mere water, it is to be wetted with a thin solution of glucose or honey. On coming out of the press, the paper is to be exposed to strong ammonia, which, it is said, will bring out clearly writing which is barely visible.

Mr. Gore, who has achieved a great reputation as an investigator of the chemical properties of substances, under conditions not obtainable by ordinary students, has now taken in hand a body whose extraordinary properties render it an extremely difficult matter to deal with. We mean hydrofluoric acid. Many of our readers who

employ the strongest acid they can procure for technical purposes, will easily understand the difficulties and risks Mr. Gore must have undergone in procuring and ascertaining the chemical properties of the pure anhydrous acid, which he correctly describes as a highly dangerous subcorrectly describes as a highly dangerous atto-stance, requiring the most extreme care in its manipulation. It was obtained by heating the double fluoride of hydrogen and potassium in a platinum vessel, and nearly all the experiments with it were made while the vessels containing it were immersed in a freezing mixture of ice and crystallized chloride of calcium. Only under such conditions could experiments be made with safety to the air passages and eyesight of the operator. At 60deg. Fah., anhydrous fluoric acid is a colourless very mobile liquid. It is much more volatile than ether, and boils at 67deg. Fah. Whe specific gravity is 0.9879 at 55deg. Fah., water being 1,000deg. at the same temperature. When perfectly dry, it has no action on glass, and the dry gaseous acid was kept in glass vessels for several weeks without rendering them in the least degree dim. We may sum up very briefly the general chemical properties of the acid. It has scarcely any action on the noble metals and metalloids. Sodium and potassium behaved with it much the same as with water. Most salts were decomposed by its action, and most organic bodies, except fats, were dissolved by it. As regards the chemical constitution of the acid, Mr. Gore has determined that, to form it, one volume of hydrogen combines with one volume of fluorine without condensation, and in that respect it is allied to hydrochloric soid. The above is a short abstract of a most valuable contribution to science. Mr. Gore's next success, we hope, will be the isolation of the element fluorine, a body which, notwithstanding some assertions to the contrary, we believe has never been obtained in a separate

Chemists and others know well the difficulty of keeping very volatile liquids. Bottles of ether for example, are shipped for India, and when they arrive are found to be more than half empty. The chemist sometimes puts a bottle of benzole or bisul-phide of carbon on his shelves, and when he next requires it, he finds the bottle empty and dry. The remedy with exporters is a luting of melted sulphur, which is difficult to apply and hard to remove. A new cement, therefore, which is easily prepared and applied, and which is said to prevent the escape of the most volatile liquids, will be useful information to many. It is composed simply of very finely ground litharge and concentrated glycerine, and is merely painted around the cork or stopper. It quickly dries, and becomes extremely hard, but can be easily scraped of with a brite and the cork or stopper. off with a knife, when it is necessary to open the

# PARLIAMENTARY NOTES.

PARLIAMENT will doubtless have a busy time of it with matters more social than scientific in their character. Still, there are always questions arising which are of interest to our readers, and which are consistent with the matters discussed in our columns. These, then, in pursuance of our usual custom, we shall place before our readers, as they arise in either of the Houses. We may first note one or two things which came before the House of Commons yesterday week, when Mr. Dodson asked the House to agree to the following resolutions, the object of which was to facilitate the carrying out of the Railways Regulation Act of last session:-" That every railway bill promoted by an incorporated company and originating in this house shall, after having been read a first time, be referred to the examiner of petitions for private bills, who shall inquire and report as to compliance with the provisions of the Act 31st and 32nd Vict., c. 119, s. 35. The examiner shall give at least two clear days' notice in the Private Bill Office of the day appointed for such examination, and standing orders 76, 77, and 220 shall be applicable to any memorials com-plaining of non-compliance with such provisions. That in the case of such bills the time limited by standing order 191, between the first and second reading, shall be extended to, but shall in no case exceed, fourteen days." These resolutions he pro-posed to supplement by a further one, providing that in the case of a meeting of a railway company that all other places, if his place were not adopted,

being followed by a poll, all the documents relat-ing to it should be deposited in the Private Bill Office. The resolutions were agreed to.

Lord GARLIES asked the President of the Board of Trade whether it was intended to discontinue the light in Portpatrick Lighthouse; and if such change was intended, to state the reasons for its discontinuance.

Mr. BRIGHT said it was intended on the part of the Government to discontinue the harbour of Portpatrick, and also the light, as it was considered that that light was of no use to passing ships, and merely served harbour purposes. But of and merely served harbour purposes. But of course if it could be shown that the light was of use to passing vessels it would be allowed to remain. The information at present before the Board of Trade was that the light would not be necessary, and that the harbour ought consequently to be discontinued.

Mr. White gave notice that on going into committee of supply on the army estimates he should move the following resolution:—"That in order to promote greater economy and efficiency, the departments of the Horse Guards and the War Office should be placed under the control of one responsible minister."

On Monday Sir J. HAY gave notice that he would, on Friday next (to-day) call the attention of the House to the rule of the road at sea, and that he would put a question to the right hon. gentleman the President of the Board of Trade upon the subject. We hope something definite

will be settled upon this point.

At the same sitting Mr. CANDLISH asked the President of the Board of Trade if he expected to be able this session to bring in a bill to consolidate and amend the laws affecting our mercantile

marine.

Mr. Bright said it was the intention of the Board of Trade to introduce such a bill. The late Government had taken some steps to put the bill into shape, and it was at present in the hands of the draftsman. It was a bill which would contain an almost appalling number of clauses, and was one which dealt with a subject of great difficulty. When it was in a sufficiently advanced shape, it was the intention of the Board of Trade to consult gentlemen interested in the question, so as to gentiemen interested in the question, so as to make it in some degree complete before it was brought under the notice of the House. The measure would be kild on the table of the House in the course of the session, but he should be very sanguine indeed if he were to hope that it would pass during the present year.
On Tuesday Mr. J. Howard asked the Secre-

tary of State for the Home Department whether, considering the evils made public by the Report of the Rivers' Commission, it was the intention of the Government to introduce, during the present session, any measure for the prevention of the pollution of rivers and watercourses.

Mr. Bruce said that the important commission presided over by Sir William Denison were now examining the principal manufacturing districts in the Mersey and the Ribble, and that they intended to pursue their inquiries still further. He could not say when their report would be presented, but he hoped that it would lay down principles which would enable the House to legislate upon the subject without causing any great injury to our manufacturing interests.

Mr. BOURKE asked the President of the Board of Trade whether it was the intention of Her Majesty's Government to propose to carry out any of the recommendations which were made by the Royal Commissioners in the year 1859, on the subject of life harbours and harbours of refuge.

Mr. Bright said that the committee had made two principal suggestions; one of them, the Board of Trade and successive Governments had refused to adopt, while the second had been ever since in course of adoption. He would only say that was advanced constantly by the Public Works Loan Commissioners at a low rate of interest—a rate varying from 3½ to 3½ per cent.—to all places where there were persons who thought that the construction of a harbour was desirable, and who were willing to give security for the money so advanced. The Board of Trade was perfectly assured that if the first suggestion of the commissioners were adopted, it would lead to an almost unlimited expenditure of the public money. Any one who wished to have his mind satisfied upon that subject had only to turn to the evidence taken before the commissioners, where he would find that the evidence always went to the conclusion that the witness's own place was not

must be of no use whatever. The consequence was, that the course which the Board of Trade had hitherto pursued was the course which it would pursue for the future.

Lord Elono moved for the appointment of a committee to inquire into the roadway and viaduet proposed to be made on the Thames Embankment from Hungerford Bridge to Wellington-street, Strand, and whether the site might not be more advantageously occupied by some public building; also, to inquire whether any, and if so, what controlling power over public works in the metropolis was vested in and exercised by any Government Department.
Mr. Tire stated that the Metropolitan Board had

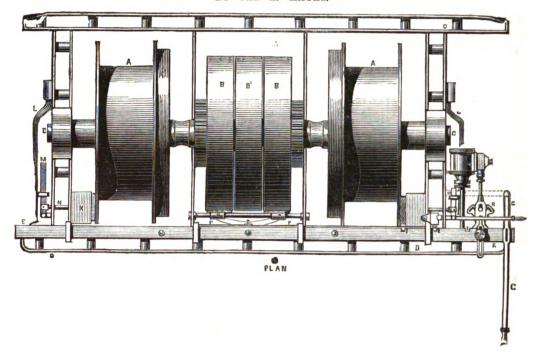
no feeling whatever in the matter, except to provide for the public benefit. It was no project of theirs, but at the same time he believed it had been much misunderstood. The simple question was the road between Westminster Bridge and Blackfriars was exactly a mile, and it was a pity that such a road should run parallel with Fleetstreet and the Strand without any lateral communication between them. However, if the committee took the responsibility of stopping this viaduct, and saving the expenditure of £230,000, it would rid the Metropolitan Board of an enormous difficulty. The only extent of viaduct that was proposed was to be 270 feet long, and the having of an arched way was forced upon the Board of Works by the Government. The object in having arches was to avoid interference with two graveyards which contained the remains of some very illustrious persons. If the committee could show how there could be a better communication, or how they could do without a lateral approach to the embankment, the board would have nothing more to say on the matter. As to the second part of the motion, it was formerly thought that the Chief Commissioner of Works was the proper authority to act. There had been very great improvements effected in London of late years, but it was a mistake to say that they had been paid for out of the rates; because the source of the revenue was the coal tax, of which the Board of Works took ninepence, and the City threepence. The motion was agreed to.

## THE METEOROLOGICAL SOCIETY.

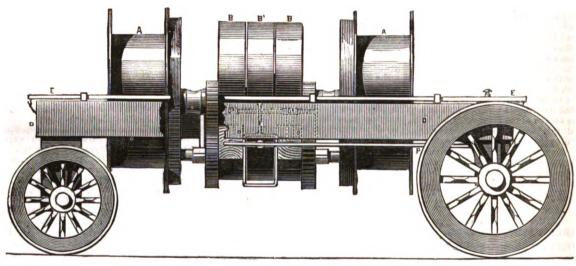
MEETING of this Society was held on the A 17th inst., at 7 p.m., at the Institute of Civil Engineers, James Glaisher, Esq., F.R.S., president, in the chair. Five gentlemen were balloted for and elected fellows of the Society. A paper was read, by C. O. F. Cator, Esq., which described his anemometer, as newly arranged with spiral apparatus, and gave an account of its registrations from September 11, 1868, to February 11, 1869. The discussion which followed turned rather upon the remarkable storm which passed up the English Channel on the 12th inst. than on the gales em-braced in the period. Incidentally, Colonel Strange raised the question of the relative value of velocity and pressure anemometers, whereupon an animated, if not angry, discussion took place as to the best method for converting velocity valves into pressure equivalents, et vice versa. Another paper was read, by C. Meldrum, Esq., of the Mauritius Meteorological Society, "On the Connection between the Rotation of the Wind in the South Indian Ocean and the Relative Positions of the Polar and Equatorial Currents." The author contended that in the South Indian Ocean wind gyrations occur in the direction of movement of watch hands, and also in the reverse direction. The object seemed to be to prove that the former, which are the normal gyrations, are frequently attended by gales and hurricanes, the winds circulating about an area of low atmospheric pressure; whilst the latter gyra-tions occur about areas of high pressure, and the winds are light. All this has been known for a long time, and has been well written upon by Buchan and others. But Mr. Meldrum seems to contend that these systems of circulation have always co-existence; the one being a necessary accompaniment of the other, and it only requires simultaneous observation over an extensive region to detect them. Dr. Mann remarked that at Natal the gyrations of the atmosphere, if, indeed, any occur, must take place in a vertical and not in a horizontal direction, for he had sought for evidence from the direction of the winds of that country from the direction of the winds of that country without success. There was but little further dis-cussion, probably because no one was clear upon the subject. This much, however, seems clear, that, in meteorology, as in other matters, old facts are continually being brought forward as new discoveries.

# PLOUGHING WINDLASS.

BY MR. E. HAYES.



SIDE ELEVATION



# HAYES' STEAM PLOUGH TACKLE.

To sa matter of history that we are indebted for the introduction of the steam plough principally to the labours of farmers who possessed some knowledge of mechanical science, and to engineers in a comparatively small way of business. Among these latter, Mr. E. Hayes, of Watling Works, Stoney Stratford, as far back as 1859, did much to introduce the steam plough into Buckinghamshire. introduce the steam plough into Buckinghamshire. He adopted the roundabout system in conjunction with a windlass distinct from the engine. This windlass he improved upon from time to time until it was very highly spoken of in 1862, when it was exhibited. Since that period, however, the inventor has turned his attention principally to a different branch of mechanical engineering, and, until very recently, although he continued to make ploughing tackle to order, he took no steps to introduce his system properly. Mr. Hayes, being known in Buckinghamshire as a maker of ploughing tackle, has found it worth his while to resort once more to its manufacture on an extended scale, and has recently effected years considerable insurance. recently effected very considerable improvements in his windlass, which entitle it to rank as one of the most ingenious combinations of mechanism in

This tackle consists of a portable engine—not self-propelling—of 10-horse power, a windlass, which we illustrate, and a set of anchors, wire rope, porters, &c. The engine has a single cylinder and a large boiler and firebox, but the windlass is the principal feature elaiming our attention. is the principal feature claiming our attention.

Mr. Hayes, knowing by experience that much time is lost at the headlands in stopping and starting the engine, or engines, where two are used, especially in foggy weather, when it is not easy to make signals, turned his attention to devising a system according to which the engine is never stopped while the tackle is at work, the delay at the headlands reduced to a minimum, and the control of the implement placed in the hands not only of the engine driver, but of the anchor man, at each headland, so that overrunning is impossible. the will of either anchor man, indeed, no matter how far removed from the engine, the implement can be stopped dead in about one second, certainly before it can traverse the distance of one foot. The engine is placed in one corner of the field to be ploughed or cultivated, with the windlass behind ploughed or cultivated, with the windlass behind it; the rope is then led round anchored pulleys, the only peculiarity being in the mode of anchor-ing at each headland the pulleys, which require to be moved at each bout. The movement is effected by the use of two plain claw anchors, to which the pulley is secured by double chains, so that it is placed at the apex of each triangle, and each anchor is lifted alternately to double the distance shifted by the implement at the end of each bout. A considerable saving of time is effected by this arrangement, but we have not space to describe it in detail.

The windlass consists essentially of two drums, on each of which the rope is wound alternately while it is payed off from the other. The drums are driven alternately from the engine by a belt

shifted from one pulley to the other. shifted from one pulley to the other. The drums A A on which the ropes are wound, the two pulleys B B which drive them, and the loose pulley B¹ in between, all revolve on the same axle C, this being a strong wrought-iron shaft, secured to a frame D D made of wrought-iron plates on the girder principle, and the whole mounted on feur wood wheels. This machine is so constructed that its centre of gravity shall fall low, thus preventing the wire ropes and strap from pulling the apparathe wire ropes and strap from pulling the apparatus out of its position. On one side of the frame is a flat bar of wrought-iron E, in the centre frame is a flat bar of wrought-iron E, in the centre of which is fixed the strap guide F. At each extremity of this bar is attached a spiral spring, connected to the frame of the windlass, and so set as to keep the strap on the loose pulley. When as to keep the strap on the loose pulley. When the strap requires moving to either of the driving pulleys, the bar E is moved by a lever G at one end-thus distending one of the spiral springs and is held in its place by a trigger or bolt H, which catches in one of three equi-distant notches I I I in the bar, to keep the strap guide opposite either of the pulleys required. When working, either of the pulleys required. When werking, one drum is, as we have said, winding and drawing the implement, which, in its turn, uncoils the loose rope from the other drum. Now, the occasional variations in the speed at which the implement travels cause great changes in the velocity of the uncoiling drum, and it would often uncoil the rope too fast running by its own momentum after a jerk. To prevent this, check brakes K K are affixed, one of which presses on the uncoiling drum by means of flat carriage springs L L. The

pressure of these springs can be regulated by their pressing on levers M M, instead of directly on to the brake spindles N N. As the brake is only required on the unwinding drum there is a short chain affixed to the end of the guide bar and the springs L L, so that when the bar is moved to give motion to either of the drums it takes the brake off at the same time. The engine driver or man in charge puts as little check as possible on the drum when at work, and this brake is not sufficient to arrest the uncoiling drum suddenly, and prevent coils of rope from running out should the implement require to stop in an instant. To prevent this in most other windlasses a man stands to put a brake on, but in this a far more effective system is adopted. Opposite each of the driving pulleys is a wooden brake O O, secured to ironwork O 1. This is connected by means of a long lever P to a piston rod working from a small cylinder Q at the end of the frame, the side valve of which is worked by a cam R connected with the strap bar, and made so that the bar in moving opens the slide valve or closes it altogether, putting on the pressure when the strap is on the loose pulley, and taking it off when it is moved to either of the driving pulleys. The pressure is obtained through a §in. tube, of canvas and india rubber, from the boiler; water is used, and at the steam pressure of the boiler. The piston moves about §in., and the brakes about §in., and puts on and takes off without noise, or attention from any one,

we have already stated that there are three notches I I I, cut into the bar, into which a small bolt or trigger H springs, to keep the bar in its position, and also that when the bar is moved to throw the strap on a driving pulley is moved against two springs, one spiral, and one flat carriage spring. It will be seen, therefore, that when at work, if the trigger be drawn from the notch, the bar will be forced into its central position by the springs, and will put the strap on the loose pulley, the water brake at the same moment being applied. Attached to this trigger or bolt are two small cords, and these are taken across the field to the anchor men. By pulling these cords they can stop the implement at the headland or any part of the field, thus enabling them to work in fogs, hilly fields, or by moonlight. The same cords ring a bell on the windlass as a signal to the driver to move the strap to the driving pulley again. The driving pulleys are connected to the drums by means of internal wheel-gear, the sliding bar E forms the key, so to speak, to the operation of the entire machine. Left to itself it would always put the strap on the loose pulley, and as it is moved to one side or other so the strap is applied to their proper wheels. The engineer attends the windlass, his duties as regards it simply consisting in shifting the strap from one pulley to the other as the plough reaches such headland. Mr. Haves apparatus has now been at work for some time on arious farms with good results. We believe Mr. Hayes intends working his machinery on a farm near his works about the middle of March next, in order to give those interested in the question of steam cultivation an opportunity of judging of its merits.

THE "France" says :- We have a resuscitation of sedan chairs. Four of them have been seen in the old faubourg. One was observed at the hotel of the de la Rochefoucault-Bisaccia, a third of the Princess de la Tremouille, and the fourth of the Marquise de Fincenes. Up to this time the chairs in question have only been used for going to church and for short morning visits. A special toilet has been invented for this sort of conveyance, consisting of a black mantilla trimmed with guipure, and the cos-tume is called a "sortie d'eglise."

THE MANUFACTURE OF WATCHES AND CLOCKS.

THE MANUFACTURE OF WATCHES AND CLOCKS.

—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 69, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consultwith their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends the appointment to the Prince of Wales, sends this pamphlet to any address on receipt of two postage stamps, and we cannot too strongly recommend it to the notice of the intending purchaser.—| ADVT. | ON A NEW FORM OF PERMANENT MAGNET

BY Mr. F. A. PAGET.\*

WITHOUT any distinctly given reason, it is taken for granted in all works on magnetism, and in all the practical applications of mechanism, that it is impossible to magnetize a plate except in the direction of its length.

Michell, in his "Treatise on Artificial Magnets, gives a determinate proportion, but without stating any reason, between the length and the weight of magnets. A magnet, for instance, 2in. long, should weigh one-tenth of a pound. Cavallo recommends a width of one-tenth; Fuss one-sixth; Musschenbroeck and, later, Coulomb, one twenty-fourth of the length. In all these cases it is assumed that the direction of the poles must be parallel with the longest dimensions of the solid bar or plate to be magnetized, and that it is impossible to regularly magnetize a square plate, and still less an oblong plate, in a direction transverse to its major axis. That this is correct with a solid continuous plate can be easily proved by experiment, and it is well known to instrument makers that it is impossible to permanently magnetize a square steel plate. No doubt such magnetize a square steel plate. No doubt such results would greatly vary with the constitution and state of the steel employed, the relations of its different dimensions, the mode of magnetization adopted; but the only experiment bearing on the question that I can discover, after much research in scientific works, is that of De la Borne, † who found, on magnetizing steel discs, that as long as found, on magnetizing steel dises, that as long as they were whole they showed no polarity, and that their polarity only appeared when they were cut in two. Dr. Lamont, in a paper which first appeared in Poggendorfi's "Annalen" (Vol. CXIII.), and was communicated to the "Philosophical Magazine" for November, 1861, by the Astronomer Royal, investigated the question of "the most advantageous form of magnets," or that form in which "are united the greatest possible magnetic mounent with the smallest possible mass and the smallest possible moment of inertia." In all the forms he experimented upon the breadth was always less than one-third of the length, and generally about one-fifth, and he does not seem to contemplate the possibility of magnetizing a square plate, and still less an oblong plate, in a direction transverse to its greatest length. Now, I find that by cutting slits nearly up to the middle of a steel plate a square plate in one piece can with such slits be regularly magnetized, and by this means even an oblong square plate can be regularly magnetized, and with as many poles as may be required in a direction transverse to its greatest length.

I herewith beg to forward a square plate magnetized in this way. It is of watch-spring steel, 0.0075in, thick and  $\frac{2}{3}$ in,  $\times \frac{2}{3}$ in, it has four pairs of alth  $\frac{1}{3}$ in  $\times \frac{2}{3}$ in, it has four of slits lin. wide cut from its edges, leaving a central web  $\frac{1}{4}$ in. wide uniting the whole. On moving a small needle round this square plate it is seen to be regularly magnetized, and on sprinkling iron filings on the magnet, covered by a sheet of paper, they arrange themselves in lines, proving that the magnet really consists of a number of small regular similar magnets, arranged below each other in the same vertical plane. On suspending an oblong magnet of this kind, with its longer axis in the vertical plane. On suspending an oblong magnet of this the needles set themselves to the magnetic meridian; on suspending it flatwise, with its longer axis in the horizontal plane, the longer axis points east and west. As well as can be judged by subjecting them to slight shocks, the magnets are as permanently magnetized as if they were separate from each other. Only time can prove whether they will lose their magnetism. The important question as to what form is the best for retaining magnetism for a length of time is one which, as Lamont remarks, no one has yet investigated.

Though I have not yet been enabled to try to magnetize a parallelopipedon of steel after slotting it vertically and transversely into a number of bars, held together by a central web, I feel very confident that this could be done. The slots could be cut into the parallelopipedon or cube while in a soft state by a thin tool, worked to and fro in an ordinary engineer's slotting or shaping machine, and the whole magnetized in a powerful electric spiral, in the way described by Elias. Besides moving the spiral to and fro, as described by him, no doubt in order to overcome the resistance to induction, the cube while in the spiral could also be struck, in order to produce that mechanical

vibration which is so favourable to magnetization and demagnetization. By pointing the needles, or giving them the rhomboidal form, it is evident that, in spite of the poles being nearer (as is well ascertained to be the case in needles of that shape), the ratio of the magnetic moment to the moment of inertia is still higher than in the assemblage of oblong needles. Though, for various reasons, the rhomboid set on its edge is scarcely ever used in practice, an easy calculation shows that it is the most perfect form for a movable magnet. It seems only to have been tried when lying flat.

#### ROYAL POLYTECHNIC INSTITUTION.

O<sup>N</sup> Saturday last, the Annual Meeting of the above popular Institution was held at the establishment in Regent Street. The chair was occupied by the Rev. J. B. Owen, and Professor Pepper, as honorary director and manager, read his report, which was of a most satisfactory character. Notwithstanding the heat of the summer weather, and the large increase of out-door attractions, the money taken at the doors during a series of several years was, as compared with the amount taken that year, not the lowest. Although, taking the year through, there had been a reduction in the amount of receipts, as compared with the previous year, of £1,000, there had been a corresponding year, of £1,000, there had been a corresponding reduction in expenditure. Amongst the new features which had attracted great public attention during the half-year had been the new electric organ, by Messes. Bryceson, the lectures on the solar eclipse, and the earthquakes in Mexico, with pictorial illustrations; whilst Mr. Tobin, in conjunction with himself, had produced some new spectral illusions of an astounding character; and the mammoth electric magnetic coil, which had been alluded to in previous reports, was now just completed, and there was every reason to believe that it would produce great and important improvements of a scientific character.

The Rev. C. Mackenzie reported that the educational department had been also successful. prizes were distributed to the successful candidates, in November last, by the Venerable Archdeacon of Nottingham. The winner of the late Prince Consort's prize was Robert Kingston, who was a

gardener, earning but 15s. a week.
From the Rev. Chairman's remarks we are glad to be able to state that the results of the past have been satisfactory in a general sense, although it appears that the takings at the doors showed a slight decrease. The various exhibitions, such as the Mysterious Hand, the Electric Organ, the optical illusion, called "The Spectre Barber" continue to prove as interesting and as attractive as anything to be seen elsewhere. We congratulate the shareholders that, notwithstanding the drawbacks which from a variety of circumstances have had to be encountered, the institution is still one of those which from its popularity continues to be a success. The receipts of the half-year from visitors, at 1s., wore £3,134 18s. 6d.; workmen and children at 6d. £501 10s. 6d.; and other items, such as reserved seats. &c., have brought the aggre-gate amount up to £4,576 19s. 6J. Although con-siderable expenses have been incurred, the profits allow of the payment of a dividend at the rate of  $3\frac{1}{2}$  per cent. for the half-year, making, with that already paid,  $8\frac{1}{2}$  per cent. per annum, a condition of things which must be highly gratifying to both the executive and the shareholders.

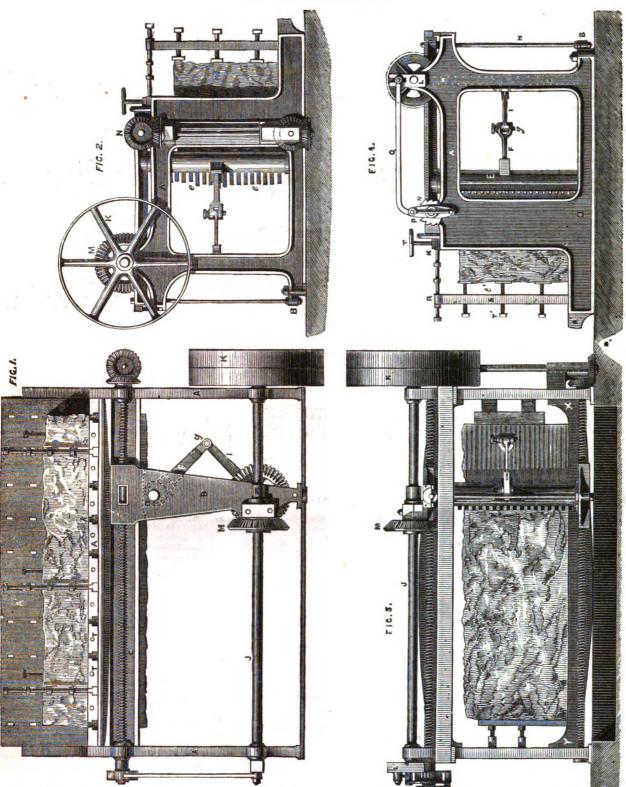
# STONE DRESSING BY MACHINERY.

NY mechanical process which tends to cheapen the labour cost upon materials for building ourposes is always welcome in a double sense. facilitates the construction of buildings of superior character for a comparatively moderate cost, thus proving a source of gain to owners of property, and it adds to the appearance of our thoroughfares, and thus becomes a national boon. In the present instance we have to notice a progressive step in the mechanical dressing of stone, which has been made by Mr. J. E. Holmes, of Chester. This machine has been introduced by the patentee with a view to facilitate the dressing of stones, especially those of the harder and more enduring class. This enables those engaged either in the production or use of stone to avail themselves of steam or water power for the performance of the more laborious part of their work. In the construction of the machine Mr. Holmes has applied the working tools to the surface of the stone in the same direction, and with the same effect as the chisel in the hands of the skilled workman. That this arrangement has been successful is evidenced by

<sup>·</sup> Communicated by the author to the "Philosophical Magazine."
† Pogg. "Ann." vol. lxxil. p. 26.

# STONE-DRESSING MACHINERY.

BY MR. J. E. HOLMES.



the satisfaction the machine has given wherever it has been introduced. We examined this machine on Wednesday last at the Salisbury Wharf, Strand, where Mr. Holmes has one on view, and found its action to be very perfect. On plain surfaces the quality of the work is equal to the best that can be produced by hand labour, while many of the mouldings, angles, and bevels required in ornamental work can be executed with facility. With these machines the quantity of stones dressed depends more upon the convenient arrangements for handling and turning over the stones, than upon the actual time of cutting. The forward feed over the surface of even the largest stones will be from 18 to 24 inches per minute; if well quarried and scabbled, two or three cuts will finish a face of 15 to 20 superficial feet in as many minutes. On smaller stones of course the proportionate quantity dressed would not be so great. Beds and joints

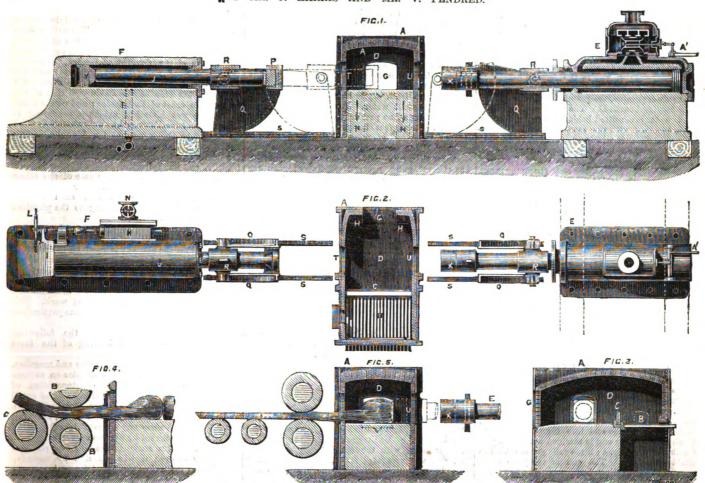
require but two cuts, if well shaped, and by using punches or grooving points, a regular matching or dovetailing of the courses may be obtained.

The general character of the machine and its mode of operation will be readily understood from our engravings, for which, and the annexed description, we are indebted to the "Mining Journal." We may premise that the machine shown in the engraving will dress a stone 7 ft. by 2 ft. 9 in. A A is the main framing, which comprises the bed-plate, A¹, on which the block of stone to be cut is fixed. B B are travelling arms, in which the cutter-stock or crosshead (fitted with chisels, picks, and tools) is mounted, and which arms and cutters are made to traverse the main frame, A A, from end to end alternately, or from left to right, and vice versa, by the screws, cc; dd are eccentric bearings, or plummer-blocks, in which the ends or journals of the cutter-stock or cross-head are centred. These bearings may be turned by a lever or levers, not shown in the engrav-

ings, and may be fixed in position by stop-bolts; e is the cutter-stock or cross-head, in which the picks, chisels, and tools are fixed. The picks or chisels are shown at ee. A lever, F, is fixed to the stock or cross-head for giving right and left hand cutting motions to the chisels or tools, as the case may be, this lever being coupled by the connecting-rod, I, to the crank of a cranked shaft, G, centred in the centre of the travelling arms, B, and turned by the mitre wheel, H. By taking out the pin, g, the connecting-rod, I, can be readily uncoupled, and the lever, F, turned so that it inclines in the opposite direction, for the purpose which we shall explain presently. J is the main shaft, having a driving-pulley, K, keyed on it at one end, and a slotted crank, L, also keyed at the other end. M is a second mitre wheel, mounted upon a short hollow shaft, m, which turns in a bearing provided on the head of one of the travelling arms, B. The main shaft, J, has a long groove cut in it to receive a tongue, or feather, in the hollow of the shaft m,

# APPARATUS FOR MANUFACTURING WROUGHT IRON AND STEEL.

BY MR. J. HARRIS AND MR. V. PENDRED.



which is thus turned by, and traverses on, the main shaft from end to end, as the arms B B are moved backwards and forwards by the screws C C. The heads of the arms B B are connected by the tie, or parallel bar, h. Bevel wheels, N, are keyed on to the ends of the screws C C, and are connected by a shaft carrying other bevel wheels, as shown. O is a ratchet wheel, fixed on the upper screw shaft at the opposite end to the bevel wheel N; whilst P, a lever centred upon the ratchet wheel O, and fitted with a double or reversing pawl, adjustable for turning the screws C C from left to right, or vice ve sa, according to the direction in which it is desired to work the cutter. A connecting-rod, or link, Q, gives a rocking motion to the lever P, by the revolutions of the slotted crank L, on the end of the main shaft. The crankpin of this crank works in a hollow screw clamp, and by varying the position of the crank-pin, the lever P can be made to turn the screws C C more or less at each revolution of the main shaft J, and thus regulate the feed. R, S and T are the clamps, screws, and cross bars by which the stone is secured in position while being dressed.

dressed.

In practice, the stone to be dressed is placed upon the bed-plate of the machine, with the side to be operated upon towards the cutters, and it is then fixed in position by the clamps and screws. The cutters having been previously moved to one end of the machine, and the cutter-head set to the required angle, the power is applied through the pulley to the main shaft, whereby the whole of the moving part of the machine will be set in motion. If the block be tolerably quarry-faced, the surface operated upon will be cut nearly true by the narrow chirsels at one traverse of the cutter-arms; and then by reversing the cutter-stock, so as to bring the broad chisels into play, the stone will be evenly tooled and finished on the back journey of the cutter-arms; by turning the block, the beds, faces, and joints may be dressed with truth and rapidity. By inclining the bed-plate or table more or less, any required angle may be given to the surfaces. Hence, when the machine is once set, the work produced by it upon any number of blocks will be perfectly uniform, causing their beds and faces, or the angle of their surfaces to each other, to be perfectly true one with another. Thus, the use of square bevels and templates, &c., and the loss of time for setting out and working marginal drafts, as when dressed by hand labour, may be avoided.

Where the stone requires a second or third rough chiselling before applying the broad tools, either the cutter-stocks can be made reversible, or the tools may be turned to clear the face, and the chisels run back. The machines can be made of almost any size, but Mr. Holmes considers it most convenient for ordinary purposes to make the cutter-stock give a cut 3ft. wide, with a traverse motion of 8ft., or so as to dress the surfaces of a block of any size up to 7ft. in length by 3ft. in width. For convenience of locomotion, the main frame may be provided with wheels, and, when necessary, a swing or travelling crane may be added to facilitate the operations of moving and turning the blocks of stone to and from and upon the bed-plate. We may add that these machines are now being manufactured by Messrs. Ormerod, Grierson and Co., of Manchester, and by Mr. B. Johnson, of Chester.

# IMPROVED METHOD OF MANUFACTUR-ING WROUGHT IRON AND STEEL.

DY the invention we are about to describe, and which is illustrated in the accompanying engravings, some important improvements are effected in the manufacture of wrought iron and steel, whereby the production of homogeneous masses of iron or steel may be accomplished with ease and certainty. This invention has recently been patented by Mr. John Harris, of the Harefield Iron Works, Middlesex, and Mr. Vaughan Pendred, of Crohill Villa, Milton-road, Dulwich. By the aid of this process, masses of iron or steel may be produced of sufficient size to form a girder, rail, shaft, armour-plate, &c., which will be homogeneous throughout, in so far that they will be without any weld, in the ordinary sense of the term. Some years since, the welding of two or more puddled balls into one, under a steam hammer, was practised in Wales, and, by this means, large masses were produced, but the process was not satisfactory, because the surfaces of the balls became oxidized, and good union could not always be secured between them in consequence. Puddled balls are now welded in the same way, both at Consett Iron Works, Durham, and on the continent of Europe, but the process is, in both cases, open to the objec-

tion we have just pointed out. Now, by welding the puddled balls together in a furnace, according to the present invention, a perfect union is secured, because the iron at the time of welding is surrounded by a deoxidizing or neutral flame, caused to be present in the forging hearth by regulating the damper. The formation of scale is thus effectually prevented on the faces to be united; the iron or steel, too, being maintained at a high temperature, the cinder or slag is kept fluid or lively, and may be the better expelled. Another advantage is that the cost of producing rails, armour-plates, &c., will thus be much reduced, because a mass of homogeneous iron or steel may be made at once of sufficient size to form a rail, armour-plate, or shaft, and the process of reheating, cutting, and piling, may therefore he dispensed with.

acc., will thus be much reduced, because a mass of sufficient size to form a rail, armour-plate, or shaft, and the process of reheating, cutting, and piling, may, therefore, be dispensed with.

In our engraving, A, figs. 1, 2, 3, 4, and 5 is the welding furnace shown in end section in fig. 1, in plan at fig. 2, and in longitudinal section at fig. 3; B is the grate; C, the bridge; and D, the forging hearth or chamber; E, figs. 1, 2, and 5, is the steam hammer; and F, figs. 1 and 2, is the hydraulic anvil. The products of combustion are led away from the forging hearth to a suitable stack by two flues, opening into the hearth near the charging opening G, and marked by the dotted lines H H, fig. 2, which descend into a horizontal flue. The hydraulic anvil consists of a heavy casting I, figs. 1 and 2, in the upper part of which is a cylindrical cavity, within which the ram J works; this ram is double-acting. Water is admitted to either end of the cylindrical cavity by a common slide valve, contained in the box K, and actuated by the hand wheel L and the screw M, fig. 2. The water is introduced under pressure obtained by an accumulator, or otherwise, into the box K, through the stop valve N, and is withdrawn from the ends of the cylinder by the pipe O, fig. 1. The ram J is made of such length that it may be thrustinto the middle of the width of the furnace, and it is made with a dovetail slot in the end to enable a head or tup of any required form to be secured to it, as shown at P, in figs. 1 and 2. Q Q are two arcs or segments of wrought or east iron pivoting on the crosshead R; these arcs support the weight of the ram, rolling on the rails S S. When the ram

is thrust forward as far as it will go, the arcs assume the position shown by the dotted lines in fig. 1. The ram enters through the opening T, figs. 1 and 2. G, figs. 1 and 2, is the charging door through which the puddled balls to be welded are introduced.

E, figs. 1, 2, and 5, is the steam hammer, the ram or tup of which is supported by two arcs Q Q, a crosshead R, and rails S S, figs. 1 and 2. hammer is in other respects not different from ordinary hammers. The head or tup X of this hammer is made so that it can easily be replaced when worn out; it enters the forging hearth D through the opening U, figs. 1, 2, 3, and 5. In using this apparatus, the puddled balls are placed in the forging hearth D. The door closing T is raised water is admitted behind the ram piston V, which, together with the ram, is pushed forward to a proper distance within the furnace, or until it touches the puddled ball. The door closing U is then opened, and the lever A 1, figs. 1 and 2, being actuated by an attendant, the steam hammer is put in motion, and the puddled ball resting against the anvil ram J, is slightly flattened. Another ball is then placed in contact with the first, and welded to it by blows from the steam hammer, and the process is continued as quickly as the balls can be properly with suitable tools, through the charging hole G. As the mass in Directory ram J is caused to recede by an attendant, actuating the hand wheel L. When the mass has reached the required size, J is withdrawn altogether, and the mass is pushed out through T on to a trolly and is removed to be dealt with by rolling, hammering, &c., being still at a welding heat. If found desirable, a stream of water may be made to circulate through those portions of the anvil and steam hammer exposed to a great heat, in order to keep them cool

In some cases, the anvil I J is dispensed with. rolls being substituted in its stead. This modifica-tion is shown in figs. 4 and 5. In fig. 4, the manufacture of a curved armour-plate is illustrated. In carrying out this portion of the invention, a piece of armour-plate, or other heavy plate, is introduced at one end into the foreing hearth D, while the other end is retained between a pair of rolls B<sup>1</sup> B<sup>1</sup>, fig. 4; these rolls are mounted in suitable housings. The end of the plate being brought to a welding heat, puddled balls are welded against the end by the steam hammer. After a sufficient number of balls are thus attached to the plate and to each other, the rolls are put in motion, and the plate withdrawn and rolled back-wards and forwards, the rolls having a reverse motion until the proper thickness is attained. end of the plate is then restored to the welding furnace and more puddled balls welded to the It is then once more withdrawn, and the additional length of iron so secured is rolled down to the proper thickness. C is a roll so placed as to give the required curve to the plate. way, semicircular rings of solid iron may be made for turrets. Fig. 5 illustrates the manufacture of a flat armour-plate. In some cases, the rolls have a slow continuous motion in one direction, so that the slab of iron is withdrawn from the furnace at just the same rate that it is increased in length by the addition of puddled balls, and two or more sets of rolls may be worked in advance of each other in order to bring the plate to the proper thickness. In all cases, the rolls have water circulated through In our engraving, they are shown hollow and filled with water, but this arrangement may be varied to suit circumstances. In some cases, the inventors substitute for the steam hammer a second hydraulic anvil, and they then accomplish the welding together of the puddled balls by pressure instead of percussion. The two so-called anvils then act the part of hydraulic presses, between which the puddled balls are squeezed together.

LAGOONS AND MARSHES ON THE SHORES OF THE MEDITERRANEAN.

BY PROFESSOR ANSTED, F.R.S.

AT a meeting of the Institution of Civil Engineers, held February 16, 1869, Mr. C. H. Gregory, President, in the chair, the paper read was on the lagoons and marshes of certain parts of the shores of the Mediterranean.

The author commenced by alluding to the relations of physical geography and geology to engineering, and proceeded to describe the state of the Rhone, its delta and the tract called the Camargue. He remarked that the actual delta was limited to the west by the stream of the wide near the Golo, and 400 yards at the other end.

Vidourle, and to the east by the Cran: its extreme breadth being 40 miles, and its area 180,000 acres; and he noticed that while the main stream had gradually been shifting towards the east, the pseudo-deltaic formations subordinate to it had south. He then alluded to the condition of the Rhone current, and the evidence that the delta had advanced outwards towards the sea within the historic period by a distance measured by miles. The mode of formation of the delta was described as follows:-Sand, drifted by marine currents from the south-east from beyond the mouth of the Rhone, formed mounds or dunes, at places where fresh water running down from the land met the salt water. The dunes increased in number along a line parallel to the shore, till they formed an imperfect border to brackish-water lagoons. During summer, the dunes became connected, and in the rainy season breaches were caused by the sea. At length, a complete barrier was effected, and a nearly fresh-water lagoon was The same work was then repeated, and formed. the lagoon was filled up, more or less completely. in the course of time, by warping, so that a permanent addition was made to the land. The largest lagoon of the delta (that of Valcares) was next described. It covered 25,000 acres, and was protected by an artificial sand dyke, 161 miles completed in 1857. The other executed, with the exception of some locks and canals to keep open channels to the sea, were very

Details were next given of the great system of lagoons extending beyond the true delta of the Rhone to the Cape of Agde, a distance of nearly 40 miles, which the author believed to be of no great geological antiquity. Beyond the delta, the district consisted at first of the tertiary deposits, near Montpellier, then of the jurassic formations of the ridge of the Gardčole, and finally of the basaltic rocks, continued from Central France, and which terminated at the Cape of Agde.

lagoon of Mauguio, the first beyond the Vidourle, had an area of 8,000 acres; its greatest depth was 4ft. 7in. and the level of the water was below the Mediterranean in summer. communicated with the sea by only one opening, and was separated from it by a sandbank at 11 mile wide, gradually narrowing to 500 yards or 600 yards. Towards the land were extensive marshes, and all the villages around were very unhealthy. It received the drainage of about 78 square miles, by a number of streams, the longest of which was about 13 miles. This lagoon was nearly separated from the next (the lagoon of Perols) by a tongue of land, beyond which came the drainage of a stream (the Lez). The lagoon of Perols, and the next in order, that of Grec, covered about 3,300 acres, of which about 2,425 were under water, the rest being marsh. The maximum depth of water was only 33in. below the summer water level, which was 7in, below the Mediterranean. The marshes around were about 10in. above the water level. lagoons received little water from the land immediately around. They had been fed almost entirely from the drainage area of the Lez, now conducted by canals direct to the sea. The drainage area of the Lez was 125 square miles, but the effect of rain was rapid and considerable owing to the form of the ground, and the extremely heavy showers that sometimes fell. There were three lagoons between that of Grec and the great lagoon of Thau, the total water area being 11,280 acres. They received the drainage of about 33 square miles of country, and the physical conditions accounted for the lagoons. The lagoon of Thau covered 20,000 acres, its only natural outlet being at the extreme south. It received the drainage of about 120 square miles of The works projected for the improvecountry. ment of the sanitary condition of the coast, and the recovery of the marsh lands, were next alluded to, and were stated to be on the whole satisfactory.

Attention was then directed to the lagoons of the East Coast of Corsica. These were derived from the detritus brought down by the rivers from the mountains. The Golo was the chief river, and the lagoon of Biguglia the largest lagoon. It extended north of the Golo, its length being 73 miles, and average breadth for six miles 1,000 yards. Beyond this, to the north, was a narrow neck of water communicating with the sea. The total water area was 4,750 acres; the maximum depth was 4ft. 6in. and the mean depth 333 in. It was separated from the sea by a sand bank, 900 yards wide near the Golo, and 400 yards at the other end.

During storms, the waves washed over it at two points. The water was sometimes fresh, and sometimes salt. The drainage area supplying water to the lagoon was 70 square miles, but it was made up of three parts,-one between the Golo and the river Bevinco, the principal feeder,the next, the drainage area of the Bevinco,-and the other, a small space of ground supplying water to the neck beyond the Bevinco. The author then explained the history of the lagoon, and pointed out that by separating the district, and conducting the waters of the Bevinco to the sea, the condition of the larger part (about 4,000 acres) was not at all unfavourable for complete drainage. He compared the case of the Bevinco to that of the Lez, on the coast of Languedoc; and pointed out that there was historical evidence rendering it probable that the Bevinco had only recently added its waters to the lagoon of the Biguglia, owing to the gradual advance of the dunes that inclosed the latter; and that the coast was comparatively healthy, and was inhabited, before this event took place. He mentioned that the case of the other lagoons along the coast was similar generally to that of the Biguglia; but that each needed separate consideration, according to the physical geography of the district.

Rainfall statistics both of the coast of Languedoc and that of Corsica were then given, from which it appeared that the average rainfall on the coast of France, near the delta of the Rhone, was about 36in., and of the coast of Corsica not more than 24in. for the years of observation. The extremes were, however, very great, and the mean annual fall was of little value for practical work. The seasonal falls were also given, and some particulars

of heavy rain on both coasts.

The author concluded with the following summary of the practical bearing of the facts adduced:—

First. That the malarious lagoons and marshes, of which there were so many examples on various shores, were the result of the interception of waters coming off small tracts of land, or of small and torrential streams, by banks of drifted sand and mud, proceeding from larger rivers, carrying out to some distance large quantities of detritus which was distributed by marine currents.

Second. That a study of the existing physical geography of each district affected by malaria, combined with a knowledge of its geology, was sufficient to explain the conditions, and to determine the history of the operations that had terminated in the formation of the malarious marshes and lagoons.

Third. That the removal of malaria, whether

Third. That the removal of malaria, whether to be effected by complete drainage or by partial drainage, accompanied by the keeping certain lagoons in free communication with the sea, could only be hoped for by engineering operations, based on the special history of the case under consideration, as determined by a knowledge of the physical geography and geology of the district.

Fourth. That, in certain cases where small torrential streams had been kept back from the sea by the rapid accumulation of drifted sand, the drainage of the marshes and lagoons might be rendered comparatively easy by keeping open a permanent channel for such streams.

Fifth. That the principle of breaking up the drainage areas supplying water to the lagoons into smaller areas, each of which admitted of separate treatment, being suggested by the history of lagoons generally, was the principle which should be adopted in all cases where sanitary improvement was called for, and would generally be found advantageous in an economic sense.

ALAND'S INJECTOR FAN BLOWER, AND EXHAUSTER.

cently been effected by Mr. Aland in the construction of rotary blowing fans, by which their efficacy is much augmented, and their cost materially diminished. These desirable consequences have resulted from a close observation of the defects of existing contrivances of the kind, and a series of practical experiments for the purpose of obviating them. It is well known to ironfounders and others that the driving of fans at very high velocities absorbs considerable steam power, and that the operation is attended by a very unpleasant noise. In addition to these disadvantages, it has been conclusively demonstrated by the gentleman above named that much of the air "sucked," so to speak, into the casing of the old fans is again expelled through the "eyes," and, therefore, wasted. This is a fact which may be easily proved by placing the hand or a lighted



candle near the openings alluded to when the fan is at full speed. The blades in such instances are literally "beating the air," and losing nearly half the effect they should produce on the furnace. It was mainly with a view to economizing the power employed in propelling fans, and ensuring the complete utilization of the air set in motion by the blades, that Mr. Aland devoted his attention to the subject. It is satisfactory to be able to state that he has accomplished both these desiderata, and that if he has not annihilated the humming noise, which—if heard by Mr. Babbage, would make that gentleman more lenient to itinerant musicians—he has certainly minimized it. It will be some con-solation to those who possess old and noisy fans to be informed that at a very small cost, and in very

short time, they may have them modified and silenced on the patented principle of Mr. Aland. The main features of the alterations introduced may be briefly adverted to. They consist in the formation of lateral spaces between the sides of the fan and its outer easing, and the application of a ring of metal, inclining inwards, to the periphery of the inlet openings. The effect of this last-named arrangement is to direct a certain pressure from the discharge to the supply side, near the centre of the fan, and thus to intensify, as it were, the density of the air within the casing, and give the blades something more substantial to deal with than ordinary atmospheric molecules. It will be readily understood that by such a mode of procedure it becomes simply impossible for any portion of air that has once gained admission to the fan chamber to go in any direction but the right one, or do anything which is not desired. Leakage has thus been positively and completely obviated; the engine no longer does unnecessary duty, and, of course, not one pound of fuel is needlessly consumed under its boiler. Another advantage arising from the creation of a superior and uniformly preserved density of air within the fan chamber, is that "back lash," so destructive of ordinary fans, is entirely avoided. The blades impinge upon a steadily-resisting medium, and they as steadily overcome its inertia and make it "move on" in a constant stream to the furnace.

From personal inspection of the Aland fan we are enabled to speak in positive terms of its superiority over all others at present in use, and in the interest of our readers, therefore, its merits are now referred to. It is unknown to us whether or not the inventor has thought of introducing his fan to the notice of mine owners, and others con-cerned in the operations of "the world underground," but there can be no doubt of its value as an accessory to those operations. Whether used in sucking poisonous and deadly gases out of the galleries and workings of a coal pit on the exhaustive system, or in blowing fresh air down to dilute fire-damp, and render it non-explosive and innoxious, the Aland fan must prove—as we think—of the highest service.

In converting the fan into an exhauster, it would be simply necessary to connect the two inlet openings, by means of enclosed side pipes, with the chamber vessel or space to be exhausted. It remains to be said that in deciding upon the form of the blades of this contrivance, the inventor followed very closely such scientific theories as seemed very closely in regard to them, and that purples. most rational in regard to them, and that professional knowledge and actual experimentation have enabled him to reduce those theories to successful practice. The fan blades are curved laterally and vertically in a peculiar way, and in their action they "beget a smoothness" which is not attained to by those of a flat and rectangular shape. It would be improper to omit saying that the outer casing of the Aland fan is not flanged and belted casing of the Aland fan is not flanged and bolted together perpendicularly as is usual, but is formed in two halves, and united horizontally. The roof of the casing—if the term be admissible—is of cast iron, very thin and light, and of a not ungraceful shape. The contrivance is of a simple character, so far as details are concerned, the friction of parts being very slight, and choking at the sides scarcely possible under any circumstances.

# A NEW ANCHOR.

A NEW ANCHOR.

It is now upwards of fifty years since Mr. Pering first drew the attention of the British navy to the defective character of the old plan long shanked anchor, which was the only one then in use in the navy. Since that time many and various improvements and modifications have been suggested and made. The effort has been to make an anchor which shall be more effective, and at the same time less cumbersome than the old anchor with its widespreading fixed flukes, with its massive shank and its huge wooden stock. The first successful im-

provement was made when iron movable stocks were introduced. These, however, were first used only with anchors weighing less than 1,500lb. and it was not until 1832 that the British navy extended the use of iron stocks to anchors weighing 3,000lb. In 1847 it was still further extended to 5,600lb., and in 1852, to anchors of 6,000lb.; and now iron stocks are in use with anchors of all sizes and weights. The next important improvement was made by Porter in 1837. His anchor consisted of three main pieces—the crown and arms being one, the shank another, and the stock the third. The oscillatory principle of that anchor was its most remarkable feature, although not entirely new. The crown moved on a bolt in such a way that when one arm was in the ground the other pressed upon the shank. This anchor, subsequently to 1846, passed into provement was made when iron movable stocks was in the ground the other pressed upon the shank. This anchor, subsequently to 1846, passed into the hands of Mr. Trotman, who introduced some modifications of the horn and palm, and now it has been generally adopted in the British service. Other inventions have also been patented from time to time, such as those of Rodgers, Lenox, Mitcheson, Hawkins, Aylen, Cotsell, Hutchens, Morgan and Little's, and many others. Very few of them, however, have stood the test of practical experiment.

The necessity of some new improvement, which should get rid of the heavy and cumbersome stock, was long ago pointed out, and must readily occur to any one familiar with the use of anchors. Cotsell, in any one familiar with the use of anchors. Cotsell, in his standard treatise on ships and anchors (London, 1856), referring to this subject, says: "As the office of the anchor-stock is simply to cant the anchor when the arms are lying flat on the ground, the imposition of any further duty is foreign to its purpose, ill-advised, and highly objectionable. With the present advance of mechanical knowledge, we may with home to see an anchor of simple construcwe may yet hope to see an auchor of simple construc-tion, and at the same time efficient, that shall require no stock. For my own part, I see no reason why this object may not be accomplished." The same author afterwards refers to several attempts to do away with the stock, which had not been attended with success, but repeats his conviction that the desired end would yet be obtained.

desired end would yet be obtained.

Now, thirteen years after the language we have quoted was written, an American appears with a new anchor which meets entirely the advantages suggested by Cotsell in a remarkably novel, yet simple and effective way. It is Mr. Frederick Wittram, of California, but a native of New York, and now residing in the latter place. Mr. Wittram's anchor is covered by Letters Patent in the United States and throughout Europe. It seems to us, beyond a doubt, the most ingenious and effective anchor ever introduced, and is likely to entirely supersede all other anchors now in use. As Mr. Wittram's anchor is so entirely different from all others, we have inserted the accompanying engraving showing



two different views of it. As will readily be noticed there is little to suggest the old time-honoured anchor which, under slightly varied forms, has been in use for hundreds of years, and has symbolized for

to foul, or in the event of a ship grounding upon her anchor, for her bottom to be injured, which frequently occurs when the common anchor is used. Fig. 2 represents the anchor as it appears when catted at the bow of the vessel, and hung by the ring in the crown, having both its flukes concealed within the body of the shank, or as it also appears when stowed. when stowed.

This anchor has been thoroughly tested, both in

This anchor has been thoroughly tested, both in its working and holding capacity, and has been approved of by many officers of the navy, and also by many masters of the merchant service. It does not drag or foul, it is without a stock, will not injure the bows in weighing, catting or fishing, and can be as compactly stowed as a log of wood of the size of the shank. Its many advantages over other anchors were demonstrated in various trials at San Francisco. as compactly stowed as a log of wood of the Size of the shank. Its many advantages over other anchors were demonstrated in various trials at San Francisco and in New York Bay. In both cases a 1,100lb. anchor was used. The experiments at New York were under the supervision of Mr. Charles H. Haswell. It was proved that the same grappling power is attained with 33 1-3 per cent. less weight of anchor than in the case of the Admiralty anchor. By dispensing with the stock, 20 per cent. of weight is saved. The anchor has been exhibited to Admiral Farragut, Rear-Admirals Radford, Godon and Thatcher, and other navy officers, and has received their hearty approval. We hope, if this anchor is introduced, America will begin to manufacture her own anchors. Now, seven in ten are imported from England, whence also a large part of our cables come.—American "Army and Navy Journal." our cables Journal."

# Obituary.

WE have to record this week the decease of Mr. John Graham, Chief Coiner of Her Majesty's Mint. This gentleman succeeded the late Mr. Brande, F.C.S., two years since, and therefore his tenure of the office in question has been very brief. Mr. Graham was brother to the present master of the Mint, and unfortunately for himself had very bad health during nearly the whole time he held the appointment of Chief Coiner. His death took place on Monday, the 22nd inst., at his official residence within the Mint. The vacancy thus residence within the Mint. The vacancy thus created places what might be considered an important post and a good salary at the disposal of the Treasury. It is to be hoped that a practical and efficient gentleman will be appointed to fill it. Many improvements are needed in respect of the metallic currency of the kingdom, and it is not improbable that in a few years it may have to be entirely remodelled on some kind of international system. In such case a very considerable amount of responsibility would fall upon Her Majesty's Chief Coiner.

# Correspondence.

EXPLOSIVE COMPOUNDS.

EXPLOSIVE COMPOUNDS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I was much pleased to read the admirable and exhaustive paper on the above subject read, by Mr. Perry F. Nursey, at the Meeting of the Society of Engineers on the 1st inst., and reported in your paper. I think, however, that some distinction might be made between fulminants or detonators and the simple explosive compounds that produce no effect when fired in the open air, the former being utterly useless for artillery, large or small, while among the latter may be found a perfect substitute for common powder. The manufacture of a successful substitute must not depend upon high chemical knowledge or manipulation, and the compound must be such as to be freely managed by all who are accustomed to the use of ordinary powder, and, at least, not more dangerous, and that shall not foul the barrel. All these qualities are possessed in an eminent degree by the white powder which accidentally bears my name, the name of the original inventor being unknown to me. This powder and its characteristics are referred to by Mr. Nursey in his paper, but I venture to ask space for a few further remarks in support of the safety and power of this compound. It will not explode in the open air, but merely deflagrates, though, when confined, it apparently exhibits at least four times the propulsive strength of the black powder. Indeed, it will do work which it is impossible to accomplish with ordinary gunpowder by any means whatever. As the use of the cartridge is now universal, non-granulation is no objection, while its two principal properties—enormous propulsive power and condensation—would, on its general introduction, reduce the weight and size of firearms and ammunition probably by one-third. In its manufacture, as the simple substances are actually inexplosive, it will be impossible TO THE EDITOR OF THE "MECHANICS' MAGAZINE." in use for hundreds of years, and has symbolized for us the passion of Hope.

Fig. 1 represents the anchor with the flukes thrown out, and as it appears when dropped from the ship and in use. The flukes swing to either side of the shank on large bolts, and at right angles to each other, so that no matter how the anchor should chance to fall, one or both flukes will take hold, while at the same time there are no projections above the shank, as the stock or unused fluke in the old anchor. It is therefore impossible for this anchor

only in such quantities as may be required for only in such quantities as may be required for delivery, and then only become as dangerous as that in common use, but not more so. The fine powder cannot leak out so as to form a train ready to fire the whole mass, and it is also proof against a damp atmosphere. A sample that had been kept in a damp cellar for twelve months, and had apparently become a mass of slime, when dried in warm air, recovered all its former qualities as perfectly as when fresh made. The objections to the introduction of white powder arise from two sources principally—the commercial

all its former qualities as perfectly as when fresh made. The objections to the introduction of white powder arise from two sources principally—the commercial and manufacturing interest and the professors of scientific chemistry. The chemist tells me not to meddle with chlorate of potash—it is so dangerous an explosive; but it is in daily use in large quantities without fear, as, when alone, it cannot explode. The same gentleman tells me that I do wrong to make the mixture mechanically—that I ought to make the three solutions in distilled water, mix them, and evaporate to dryness. The result, according to these instructions, would be a powder that could neither be touched or handled without destructive explosion. When, however, it is made by mechanical means, it is as serviceable and handy as the common black while it does not foul the barrel, but leaves it perfectly dry after any number of discharges. The small carbonaceous debris which may be seen when fired in the open, are either consumed by excessive heat or are blown out at every successive discharge. It has long been observed that a very large portion of black powder is always blown out unconsumed, and which of course has not contributed to the expulsion of the shot. This fact is plainly visible to a person standing immediately behind the rifleman with the sun in his face, as many targets are placed most absurdly due south, as is the case in this town. The black grains may be seen to issue from the muzzle, and afterwards in flame by the

are placed most absurdly due south, as is the case in this town. The black grains may be seen to issue from the muzzle, and afterwards in flame by the surrounding heat, indicating a waste perhaps to the amount of half the whole charge. This waste cannot take place with white powder, which, from its compact form, instantly ignites through its whole mass, and every particle does duty in expelling the shot. From this circumstance alone, considerable economy will be derived from the general introduction of white powder. The sudden ignition of economy will be derived from the general introduc-tion of white powder. The sudden ignition of the whole charge is objected to by practical men, gunsmiths especially, who say, following an erro-neous idea of Sir W. Armstrong, that slow-burning gunpowder is what is required for artillery, both large and small. Sir W. Armstrong, when he began to make wrought-iron coil guns (a mode of manu-facture laid before the public by me four years before the date of his patent), found that the breech of his gun was blown off—in one case, forty varia astern. In the date of his patent), found that the breech of his gun was blown off—in one case, forty yards astern. In consequence of this, he originated the idea of slowing the combustion of the powder instead of increasing the mass of metal. But the aim of the artillerist is length of range and depth of penetration—objects which depend entirely upon initial velocity, and which are attained in the highest degree by the use of white powder. A breech blowing off is a certain indication that a greater amount of solid metal is required behind the bottom of the chamber.

I find that an erroneous idea prevails that I use the same powder for percussion, but such is not the case, for my white powder will only ignite between the hammer and the anvil of a blacksmith's forge, certainly not under the hammer of a gun lock.—I am, Sir, yours, &c.,

HENRY W. REVELEY.

certainly not under the hammer of a gun lock....I am, Sir, yours, &c.,

1, Baker-street, Reading.

[According to Mr. Reveley, after manufacture, white gunpowder "only becomes as dangerous as that in common use, not more so." What Mr. Nursey, in his paper, advocates, and what public safety demands, is a compound possessing the qualities of perfect safety from explosion when being handled or transported, and a power equal or superior to that of gunpowder when confined in space for work. Of course, this view refers to explosive compounds for blasting and quarrying, and is irrespective of their use in firearms. Gun-cotton has proved itself practically applicable to this purpose, and is largely used in sporting cartridges, and we may in time expect to see its use extended to military purposes. Mr. Reveley has satisfied himself as to the usefulness of white gunpowder in this direction, but he has yet to convince the authorities, and satisfy the public on the point.—ED. M. M.]

# A SIMPLE GALVANIC BATTERY.

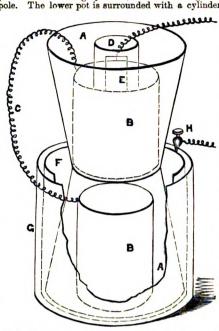
A SIMPLE GALVANIC BATTERY.

SIR,—The accompanying is a sketch of a simple way of making a galvanic battery by means of two ordinary flower pots on the principle you kindly published in the MECHANICS' MAGAZINE for November 13 last. The reason that I trouble you with the above is that your readers may construct for themselves, at a trifling expense, a battery that does away with the use of sulphate of copper in crystals.

does away with the use of A.A. are well cemented crystals.

Two ordinary flower pots A.A. are well cemented together at the base; a free passage, however, being allowed through the holes. The copper solution is divided by a partition or diaphragm having a small aperture as the hole in a flower pot. A dylinder of copper B is placed in each division connected by a copper wire C. The mouth of the bottom pot is covered with a layer or two of moist

bladder, and in the upper one is a porous tube D containing acidulated water and a plate of copper, platinized silver or graphite E, which is the negative The lower pot is surrounded with a cylinder



of zinc F and an outer jar G. H is the zinc or + pole. If a glass tube instead of a porous one, and one end covered with moist bladder be employed, the liberated hydrogen can be seen rising to the surface. I have one constructed in this way working at the present time. 95, Cross-lane, Salford. JAMES HOWARD.

## NITRATE OF SODA.

NITRATE OF SODA.

SIR,—The question, whether the present cost of nitrate of soda can be reduced by improvements in its manufacture, or by diminishing the expense of its conveyance from the nitrate deposits of Peru to the port of shipment, is of importance, not only in connection with the Heaton process, which has been described in your journal, but is also of great moment to the agricultural interest. From having, during many years, been more or less in professional connection with this question, from visits made to the locality, and from having been consulted by the manufacturers and others upon various points relating to the business, I may confidently venture to affirm that the cost to the importer of nitrate of soda may, by improvements in its reduction into commercial form, and by increased facilities of transport, be reduced at least 26 per facilities of transport, be reduced at least 26 per

The natural deposits of nitrate of soda exist chiefly in the vicinity of La Noria, near to the port of Iquique; but such deposits are met with in isolated patches extending over an extent of country computed by the best authorities at fifty square leagues, with an estimated quantity of this mineral of 63,000,000 of tons, so that it may be considered as almost inexhaustible. The crude nitrate, called by the natives "Caliche," is excavated upon the surface of the ground, below which surface it is found from one inch to many feet in depth, the beds varying in thickness from a few inches to several feet. From a paper of William Bollaert, Esq., F.R.G.S., read before the Royal Geographical Society last year, it is stated that about 100 works are in operation, yielding employment to a population of nearly tion, yielding employment to a population of nearly 20,000 souls, and about 15,000 animals; the greater part of which are employed in the transport of fuel and provisions up to the works from the coast, and in conveying down the nitrate for shipment.

The process of manufacture, which consists simply

in separating the salt from the earthy matter with which it is found in combination, is now exceedingly costly, on account of the scarcity of fuel, which has to be brought up from the sea, the mines being situated in a rainless and desert country; while all provisions, fuel, &c., have to be imported and brought up from the coast at an immense expense, brought up from the coast at an immense expense, on account of the roads being merely mule paths winding down the face of the coast range of mountains, which rise here abruptly from the sea to the height of 3,000ft. Previous to the recent earthquakes, the cost of conveyance alone of the nitrate was about £2 3s. per ton; the maximum distance between the mines and the port being only about twenty-three miles. Some years since a railway was commenced from Janieges to Le Narie was commenced from Iquique to La Noria by an was commenced from Iquique to La Noria by an English company, but in consequence of the panic the capital could not be raised, and the works were suspended after several miles of line had been form d, while a variety of schemes have from time to time been contemplated or tried so as to reduce the present great expanse of convergence of the contemplate of the present great expanse of convergence of the present great expanse of the present great e the present great expense of conveyance. The in-convenience in shipping the nitrate by lighters, and

the delays incurred by vessels in loading, have tended to augment considerably the freights. are seldom less than £3 per ton.

At the time (a year or so since) when my investi-gations were made, the cost of reducing the nitrate, its transport down from the mines, and its freight to England, stood about as follows:

Mining and manufacture (not including profit)
Transport to coast £2 19 8 per ton. 20 Shipping expenses . Freight to Europe Expenses in Europe . 5 79 8 0 £8 13 10

The above expenses by improvements in the manufacture (now in all cases but one extremely manufacture (now in all cases but one extremely imperfect), by the formation of a simple and inexpensive line of tramway from Iquique to the mines, and a mole accommodation for the shipping to load alongside, I have no hesitation in stating may most readily be reduced as follows:—

By improvements in manufac-ture, diminishing cost of fuel,

&c. £1 5 0 perton. transport ditto By improvements in shipping . Ditto ditto freights . 0 3 6 0 5 £2 11

So that, irrespective of the manufacturer's and importer's profits, the nitrate should be deliverable in England at £6 2s. 4d. per ton, instead of

in England at £6 2s. 4d. per ton, instead of £8 13s. 10d., as at present.

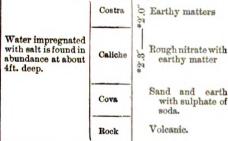
A railway, suitable for the above country, would certainly not cost more than £250,000, and as the shipments of nitrate from this district of Peru have some years exceeded 100,000 tons, the above saving of 51s. 6d. per ton should more than pay for the railway in one year; while for the rate of conveyance by railway I have, notwithstanding, allowed, as above, the very large one of about one shilling per ton per mile.

above, the very large one of about one shilling per ton per mile.

In addition to the above, I may remark, that recent advices from the Pacific inform us that deposits of nitrate of soda have been discovered in the extreme north of Chili, at La Chimba, only five or six miles from the coast; and if such be the case, as I am assured it is, the present cost of nitrate of soda may be still further reduced, at least one pound per ton.—I am Sir yours &c.

soda may be still further reduced, at least one pound per ton.—I am, Sir, yours, &c.,
WILLIAM LLOYD, Civil Engineer.
2, Dartmouth-street, Westminster, S.W.
February 17.
P.S.—Through the kindness of Mr. Bollaert, I am enabled to append the following section of the nitrate beds:—

SURFACE OF PLAIN.



Mr. Bollaert also states that the formation of a railway would dispense with the employment of nearly the whole of the animals now employed; and if we take only half the number as rendered unnecessary, or 7,000 animals at 3s. per diem for 300 days, the saving in this respect alone would exceed

hecessary, or 7,000 animals at 3s. per diem for 300 days, the saving in this respect alone would exceed £300,000 annually.

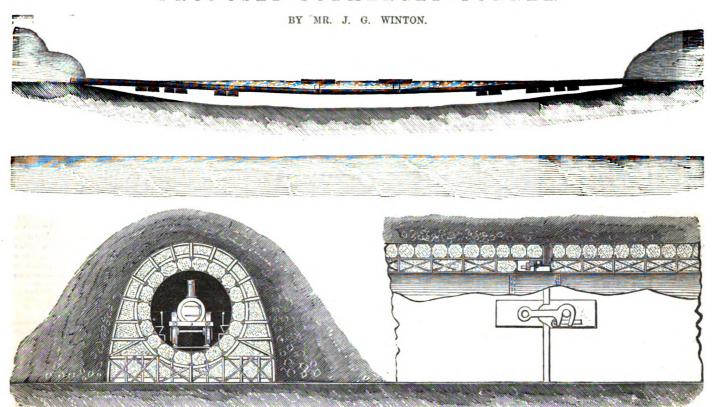
With regard to the benefits which might be derived by the agriculturists of England, I may quote from Mr. Puscy's paper in the "Journal of the Royal Agricultural Society," 1853:—"It has been proved that nitrate at its present high price can compete successfully with guano as a manure for our corn crops. It is wonderful, certainly, to have found a mineral which at the present high price (then stated to be over £16 per ton) yields us wheat at a cost of 24s. a quarter, and if cheapened, as it apparently might be, by one-half, would of course yield it at 12s. per quarter. Thus, instead of 3,000,000 quarters of wheat, costing £6,000,000 sterling, we might import yearly 200,000 tons of nitrate, costing little more (at £8 per ton) than £1,600,000 only, and so our farmers might obtain from their own farms the whole foreign supply of wheat without labour, and with but a few months' outlay of capital." outlay of capital."

# DEFLECTING ARMOUR-PLATES.

DEFLECTING ARMOUR-PLATES.
SIR, - In reference to a paper read at the Royal
United Service Institution, on the above subject, by
Mr. J. M. Hyde, and reported in your last issue,
permit me to call your attention to the fact that the
principle of deflecting armour-plates for throwing



#### PROPOSED SUBMERGED TUNNEL.



off shot and shell from the sides of vessels, was brought forward, through the Society for the Encouragement of Arts, Manufactures, and Commerce, about the year 1823-4. Reference to the Society's Transactions of about that date would, no Society's Transactions of about that date would, no doubt, bring out the history of the case. I recollect being in England at the time, and I believe I was present at the discussion on the model produced. No doubt the details would be found to differ, as armour-plates, as now made, were unknown at that period; but the principle is identical, and was partially adopted during the late American war.—Jam, Sir, yours, &c.,

HENRY W. REVELEY.

1, Baker-street, Reading, February 24.

SUBMERGED TUNNELLING.

SUBMERGED TUNNELLING.

SIR,—Some time back you noticed my proposal for tunnelling across the English Channel, with a submerged tunnel, a structure of wrought iron, filled in with concrete, constituting the proposed work. For an undertaking of such magnitude, I proposed to form the tunnel for two sets of rails, having a railway on the top of the structure, with small cast-iron wheels fitted to the bottom of each portion. Thus, when the shore tube was sunk, another could be sunk over it. Each section would thus be run down on the structure itself, and, with a suitable pontoon, lowered until it rested on the bed of the Channel. A temporary joint could thus be made with an hydraulic ring, or simply a ring of metal, pressed against an elastic medium, with a number of set screws, just similar to the packing ring of a slide valve, with suitable temporary bulkheads. A communication would then be opened up at the ends of the tubes, and the structure could be heads. A communication would then be opened up botted and riveted together permanently. I likewise considered the work should be covered over with a bank of loose stones, run down in a large truck, and emptied over the tube. In course of time, this bank would become quite compact with the natural deposit, &c. Probably a layer of stiff clay would form the best covering for the tube, in combination with the loose stones, over all. Covering the tube would be a work of time, and would in nowise interfere with the traffic through the tunnel. the tube would be a work of time, and would in nowise interfere with the traffic through the tunnel.
For shorter distances, say, two miles, I consider it
could be sunk in mass. For shallow rivers, &c., I
would form the tube for only one set of rails; thus
greater depth of water would be secured overhead;
each portion could be floated on suitable pontoons,
then jointed together with an india-rubber ring,
firmly passed into a recess in the end of one tube,
having a circular projection from the adjacent tube.
On the outside, the tubes would pivot on a centre,
secured together with strong clasps. Thus, when
the stream was bridged across, water would be let
into the pontoons at the centre, and then the structure would sink. The pontoons could then be
withdrawn, the water pumped out, and, with suitable
chains, the structure could be supported from above,
as shown in the accompanying sketch. Thus the as shown in the accompanying sketch. Thus the remainder could be removed, and placed overhead,

so as to support the mass. The chains would then be lowered, until the structure rested on the bed of the stream or arm of the sea to be crossed. By this means, communication could at once be opened up from shore to shore. Of course, a permanent joint would be made with wrought-iron plating, and the back of the plate filled in with concrete. Any number of such tubes could be laid side by side, and then covered over with a sufficient depth of rubble, clay, &c. Smaller tubes, say, \$ft. internal diameter, could securely be adopted for conveying a number of submarine telegraph wires in certain situations.—I am, Sir, yours, &c.,

18, Gladstone-street, February 18.

SMITH'S LIQUID FUEL FURNACE.

SIR,—As regards your foot note to my letter on the above subject, which you inserted in the last number of the MECHANICS' MAGAZINE, permit me to observe that the owners of Messrs. Wise, Field. and Aydon's patents, who have from time to time given due notice to infringers, are now acting under advice, and will be found fully prepared, when the proper time arrives, for taking farther steps.—I am, Sir, yours, &c., W. LLOYD WISE.

Chandos Chambers, Buckingham-street, Adelphi, February 25.

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly, payable in

of £1 is. 8d, yearly, or 10s. 10d. half-yearly, payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications anaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

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—S. H.—A. R.—W. R.—J. N.—A. B. B.—J. W.—G. W. H.
—H. M.—S. K. M.—P. O. M.—J. N.—F. T. B.—R. J.—R. S.
—A. R. W.—L. P. D.—W. H. H.—W. T.—H. W. R.—C. S.
—W. P.—M. F.—H. C.

#### Meetings for the Baeek.

Mon.—Royal Institution.—General Monthly Meeting, at 2 p.m.
Society of Engineers.—Mr. E. G. Bartholomew on "Electric Telegraphy." There will be a Ballot for the Election of New Members, at 7.30 p.m.

Tues.—Royal Institution.—Rev. F. W. Farrar on "Comparative Philology," at 3 p.m.

The Institution of Civil Engineers.—Mr. Imrie Bell,
M. Inst. C.E., on "Sinking Wells for the Foundations of the Piers of the Jumna Bridge, Delhi Railway;" and Mr. John Milroy, Assoc. Inst. C.E., will give a "Description of Apparatus for Excavating the Interior of, and for Sinking, Iron Cylinders," at 8 p.m.

Thurs.—Royal Institution.—Dr. John Harley on "Respiration," at 3 p.m.

Fri.—Royal Institution.—Mr. Huggins on "Some Further Results of Spectrum Analysis Applied to the Heavenly Bodies," at 8 p.m.

Sat.—Royal Institution.—Professor Odling on "Hydrogen and its Analogues," at 3 p.m.

## Rabal, Military, and Gunnery Items.

SMALL steamers are shortly to ply on the large lake of the Bois de Boulogne, making the circuit twice for 25 centimes.

HER MAJESTY has conferred on Admiral Sir George Rose Sartorius the rank of Vice-Admiral of the United Kingdom. Sir George Sartorius is one of the few survivors of the battle of Trafalgar.

A TELEGRAM from Trieste conveys the melan-choly intelligence that the well-known Austrian frigate, "Radetzki," has been blown up in the Adriatic, and that 300 persons were killed by the dreadful explosion.

It is reported that the saving which [Mr. Childers will propose to effect during the financial year of 1869-70 will be from £900,000 to a million sterling. It is expected that the saving in the army estimates, which are now nearly completed, will be something over one million sterling. over one million sterling.

THE French jurors of the French Exhibition at THE French jurors of the French Exhibition at Havre have awarded the bronze medal for steering apparatus to Mr. Henry Skinner, of London, for his vertical screw, which does away with the tiller and all the heavy gear now in use, as it is fixed in the rudder head, and requires only one man at the wheel in the very worst of weathers, and is besides most simple and impossible to get out of order.

simple and impossible to get out of order.

An Admiralty circular has been received at Woolwich Dockyard informing the officials that Capt. Robert Scott, R.N., has been appointed Superintendent of Gun Carriages for the Royal Navy. The conferring of this appointment at the present time seems to mark their Lordships' approval of Capt. Scott's services in constructing the new 18-ton gun carriage, the firing from which during the trial of Her Majesty's armour-clad ship. "Hercules" in her six hours' run off the Isle of Wight was conducted so successfully. was conducted so successfully.

Following the example set by France and Norway, at Boulogne, Havre, Arcachon, and Bergen, the first maritime exhibition will be held in the autumn of the present year at Naples. This exhibition, which will be international, presents an im-

portant field for British exhibitors of naval appliances, as Italy, from her geographical position, is not unlikely to become a great maritime power, This exhibition, as that of Havre, will embrace all apparatus and implements used in fishing, pisciculture, and fish curing, and will include ship stores and rewisions &c. and provisions, &c.

THE Prussian screw (armoured, iron) frigate "King William" made a trial of its speed over the measured mile, off the Maplin Sands, on Monday week, and mile, off the Maplin Sands, on Monday week, and attained a mean speed, under full boiler power, of about 14½ knots per hour. The "King William" was designed by Mr. E. J. Reed. The trial was conducted under precisely the same conditions that would have been observed on the trial of one of Her Majesty's ships over the measured mile in Stokes Bay, Nixon's steam navigation coal only being burnt in the furnaces, and the fires being in the exclusive charge of the same men who perform those duties on all important trials of Her Majesty's ships on the Stokes Bay mile—the stokers from the steam factory of Portsmouth Dockyard. from the steam factory of Portsmouth Dockyard.

The annual meeting of the Marine Society was held on the 4th inst., at the offices in Bishopsgate-street, the Earl of Romney, president, in the chair. By the report of the committee for the past year, it By the report of the committee for the past year, it appeared that during the twelve months ending December 31, 1868, 308 poor boys had been received on board the society's training ship "Warspite" at Woolwich, of whom 97 had been sent into the Royal Navy, and 187 to the merchant service. The complement of boys on board the "Warspite" had been kept up at 150 (this has since been increased to 160). We call the attention of all benevolent persons to the good which is being effected by the Marine Society in receiving so many hundreds of destitute boys and training them for employment in the sea service. the sea service.

FROM a communication transmitted to the Senate by the American Secretary of War, on January 20, it appears that during the year 1868 the Ordnance Department purchased 18,000 Sharp's rifles at 4 dollars 50 cents each, amounting to a total of 81,000 dollars; two 12-inch rifle-guns at 6,500 dollars each; one 3-inch wrought iron breechloading gun, for 3,291 dollars 75 cents; 394 12-pounder rifle shells for 2,470 dollars; ten 12-inch rifle (500 pounds) shot for 360 dollars 24 cents; forty-five 12-inch chilled shot for 2,979 dollars 31 cents; ten 13-inch (318 pounds) spherical steel shot for 1,113 dollars, and six 12-inch conical steel shot (615 pounds) for 1,291 dollars and 85 cents. The rifle shot cost 6 cents, and the chilled shot 5-975 cents per pound, and the steel shot 35 cents a pound. They also contracted for a 3-inch breechloader wrought iron rifle gun, one 10-inch rifle gun at 5,600 dollars, and two 12-inch for 6,500 dollars each, and one 20-inch Rodman gun for 28,000 dollars. FROM a communication transmitted to the Senate

### Miscellanea.

THE President of the Royal Society will give conversaziones on Saturdays, March 6 and April 24, at Burlington House, Piccadilly.

A CORRESPONDENT of the "Field" says:—On December 22, I gathered a fairly ripe strawberry, Ambrosia—it has been covered with a broken tumbler (glass)—and a bloom of "clematis azurea grandiflora."

THE chestnut tree in the garden of the Tuileries, called Le Vingt Mars, has this year anticipated, by more than a month, the usual time for putting forth its blossoms, as several are already in full bloom.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending February 20, was 5,004. Total number since the opening of the Museum, free daily (May 12, 1858), 1507,027

An advanced night school is about to be opened at the South London Working Men's College, 91, Blackfriars-road, for arithmetic, mensuration, and gram-mar, on Monday, Wednerday, and Friday evenings. Application for entrance to be made to the secretary, at the College.

An important discovery of coal has been made at Argenta, in California, situated about \$70 miles from Sacramento. This coal is said to be of excellent quality, and will, no doubt, be of great service to the American steamers that run from San Francisco to China and Japan.

THE demand in the iron trade for rails has been so THE demand in the iron trade for rails has been so large of late, that it is stated all the works, both in Wales and the north of England, are full of orders up to September next. The requirements are principally for Russia, but Austria and Hungary are likewise taking good quantities. In the other branches of the trade there is not the same activity.

Among the cabin passengers just arrived from New York, by the steamship "Columbia," was Miss Anna Swan, a native of Nova Scotia, but of Scotch descent, who is en route to London and Paris. Miss Swan is stated to be 8ft. lin. in height, and stout in

proportion, weighing about 400lb. She is 21 years age, prepossessing in appearance, has a cultivated mind and engaging manners.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending February 20, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 16,677; Mevrick and other galleries, 3,080; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 4 p.m., 1,861; Meyrick and other galleries, 242; total—21,860. Average of corresponding week in former years, 10,442. Total from opening of Museum—8,176,290.

THE statistics relating to mining in Prussia show the surprising progress made by that country during years in this industry by the introthe last twenty years in this industry by the intro-duction of improved systems of extraction by the use of steam power. In 1837 there were 1,587 mines worked in Prussia, giving employment to 33,161 miners. In 1867 this number had increased to 2,162, with 48,351 miners. The total value of the mineral production, which in 1837 was £833,932, in 1867 amounted to upwards of £8,565,000.

A NEW gold-field has been discovered in Strath A NEW gold-field has been discovered in Strath Brora, Sutherlandshire. On Saturday week, a few diggers started work in Gordonbush Burn. The quantity of gold got by each is stated to have averaged from five to twenty-five grains. The quality of the gold is equal to that found at Kildonan. Owing to the flooded state of the burn and the stormy weather, nothing was done on the following Monday, but a number have since been working during the fine weather. during the fine weather.

A COURSE of free popular and scientific lectures. including dramatic readings and recitals, is in course of delivery at the Crystal Palace every Monday, Wednesday, and Thursday. The inaugural lecture was by Dr. Thomas Wood, F.C.S., a gentleman of recognized scientific attainments, on a "Bottle of Colon Western Colon Parameters, and the Colon Parameters Soda Water, its Properties and Manufacture." The subject was very skilfully handled by Dr. Wood, and interspersed with a variety of chemical experiments, affording not only considerable amusement, but a fund of useful information to a large and appreciative

The widow and daughters of the late M. François Delessert have offered to present to the Institute of France the magnificent botanical library formed by the brothers Benjamin and François Delessert, on the brothers Benjamin and François Delessert, on condition that it is placed in a separate apartment, with the title of the Bibliotheque Delessert. This magnificent scientific library, the finest of its kind, perhaps, in France, comprises about 8,000 volumes, and the present possessors desire to carry out the views of the collectors, and preserve it entire in the interest of science, a wish which the Academy of Sciences will doubtless be eager to carry into effect.

A NOVEL form of mutual life assurance has been proposed among the persons employed in the banking establishments of New York. All may join, irrespective of health or age, and the subscription is to be a dollar. When a member dies the whole of the money in hand is to go to his family, and a new subscription of a dollar is to be made, to go in like manner to the heirs of the next deceased. The inequality of the benefit from the fact that the best lives would be taxed to insure the feeble and infirm lives would be taxed to insure the feeble and infirm would give the plan a charitable rather than an economical character, but in that shape it would, of course, relieve many cases of temporary distress.

course, relieve many cases of temporary distress.

At the monthly general meeting of the Zoological Society, held at the Society's house, Hanover-square, the Viscount Walden, president, in the chair, the Baron de Teissier, Captain Charles George Fane, R.N., Mrs. Turner, and Messrs. Charles Langford Oliver, Ernest Thomas Hankey, John Bridge, Alexander F. Cuningham, E. Breedon, Charles Horne, Stephen Busk. Frank Evans, and C. R. Wilson were elected Fellows; and Mr. John Denis Macdonald, surgeon, R.N., F.R.S., a corresponding member of the society. Thirty new candidates for the fellowship were proposed, and ordered to be balloted for at the next meeting of the society. The number of visitors to the society's gardens in the month of January was stated to have been 15,311.

THE American cotton crop of 1868 is officially THE American cotton crop of 1868 is officially estimated at 2,380,000 bales—viz., North Carolina, 140,000 bales; South Carolina, 180,000 bales; Georgia, 290,600 bales; Florida, 35,000 bales; Alabama, 35,000 bales; Mississippi, 400,000 bales; Louisiana, 250,000 bales; Texas, 260,000 bales; Arkansas, 265,000 bales; Texas, 260,000 bales; and other States, 75,000 bales. The department estimate for 1867 was 2,340,000 bales, while the actual receipts proved to be 2,450,000 bales. The estimate for 1866 was 1,835,000 bales, while the actual receipts were about 1,900,000 bales. The actual receipts were about 1,900,000 bales. The American cotton-growing interest is thus slowly recovering from the effects of the civil war of

AT the establishment for the breeding and preservation of fish at Concarneau, there are six reservoirs in the open air, with a surface equal to about 1,200 square yards, and depths varying from two to four yards, and these are supplied twice a day with fresh sea-water by means of grated flood-gates which prevent the escape of the fish. At one

extremity of these reservoirs is a large building extremity or these reservoirs is a large building containing seventy aquariums or tanks, supplied by a continual stream of sea-water, containing a vast number of fish, crustacea, and mollusks, whose forms, colours, and habits may be studied without difficulty. This is an admirable establishment for the purpose intended, and appears to be well adapted for the furtherance of abstract and practical science in connection with the creatures of the

OUR readers will doubtless remember that the man Moosa, who deserted Dr. Livingstone and reported that he had been killed, was handed over to the that he had been killed, was handed over to the Sultan of Johanna for such punishment as might be deemed necessary. Having undergone eight months' imprisonment in irons at Johanna he was, in No-vember last, sent down to Zanzibar to Dr. Kirk, Her Majesty's acting consul there, for further punishment or liberation. Dr. Kirk, writing to the Bombay government, states that in reply he informed King Abdulla's agent that his Highness had, by the punishment inflicted on Moosa, anticipated the wish punishment innicted on Moosa, anticipated the wise of Her Majesty's government, and that now it would be his duty to set Moosa free, but as one banished from his native land. Dr. Kirk assured the Sultan's envoy that Her Majesty's government would receive with much satisfaction the assurance of friendship shown by his having made an example of one had caused so much grief and anxiety through his cowardly flight and base lies. He set the prisoner Moosa at liberty, but cautioned him not to return to Johanna without the Sultan's permission.

## Natents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

warned not to produce them without an acknowledgment:—
BOILERS AND FURNACES—2409, 2412, 2424, 2451
BUILDINGS AND BUILDING MATERIALS—None.
CHEMISTRY AND PHOTOGRAPHY—None.
CULTIVATION OF THE SOIL, including agricultural implements and machines.—2444
ELECTRICAL APPARATUS—None.
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2431, 2441, 2450, 2460, 2465
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2411, 2421, 2428, 2435
FURNITURE AND APPAREL, including household utensila, time-keepers, jewellery, musical instruments, &c.—2447, 2459, 2463
GENERAL MACHINERY—2430, 2446, 2449, 2450, 2457
LIGHTING, HEATING, AND VENTILATING—2445, 2464
METALS, including apparatus for their manufacture—2417, 2418, 2439, 2453, 2461
MISCELLAREOUS—2408, 2410, 2413, 2414, 2415, 2416, 2427, 2423, 2425, 2426, 2432, 2434, 2438, 2443, 2448, 2456, 2467, 2466, 2467
ROADS AND VEHICLES, including railway plant and carriers.

2466, 2467
ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2429, 2433
SHIPS AND BOATS, including their fittings—2407, 2427, 2437, 2442, 2454
STEAM ENGINES—2420, 2458
WARFARE—2419, 2435, 2436, 2452

2402 F. A. LEIGH, Lancaster. Carding engines. Dated July 31, 1868.

This consists, in the first place, of an arrangement for effecting the enclosure of the licker-in. The patentee uses end shells, cast or otherwise formed in two pieces, one piece of each shell being formed on the pedestal in which the shaft of the licker-in revolves, the other piece being formed on the cap of the pedestal, the two portions forming a complete circle. The licker-in cover is fitted to the upper portions of the end shells, and the under guard or casing to the lower portions, the cover being connected by an intermediate V-shaped plate with the fly plate that guards the main cylinder, thus preventing to a great extent the discharge of fly from the carding engine. In carding engines having a flexible bend, the patentee makes the bend of sufficient length to sustain the fly plate. Another improvement consists in mounting the brackets or arms which carry the grinding roller upon the bosses formed on the pedestals around the bearings, so that each of the arms can be swivelled to some extent around the centre of motion of the licker-in, and be fixed by means of a set screw in the position required.—Patent completed.

2403 J. BATCLIFFE, Lancaster. Engines. Dated July 31,

2403 J. BATCLIFFE, Lancaster. Engines. Dated July 31,

The main object of this invention is to increase the power of steam engines and all other motive power ma-chines, by an arrangement or combination of cranks of unequal stroke, and levers or arms of unequal fulcrum. The crank of the first motion shaft is connected to a double The crank of the first motion shaft is connected to a double lever, free to oscillate on a ball formed on its centre; as the crank revolves, the lever follows its course, and causes another wheel at the other end to revolve likewise. This wheel gears into another wheel, the axle of which is fitted with a crank; this crank operates a second lever in the same manner as the first, any number of cranks, levers, and wheels may be employed.—Patent completed.

2404 A. G. DAY, Seymour, U.S.A. Imitation india-rubber. Dated July 31, 1868.

This consists in combining certain acids with the in-



gredients which compose the compound for the purpose of enabling the oils employed to better combine together. For a compound adapted for soft or elastic rubber goods, the patentee takes, when steam heat is to be employed for vulcanization, 201b. of linseed oil, 201b. of blcarbonate of soda, 11b. of nitrate of soda, 15lb. of coal tar, 51b. of asphaltum, 51b. of litharge, 21b. of calcined magnesia, and 81b. of sulphur. If dry heat is to be used for vulcanizing, the following mixture is employed:—201b. of linseed oil, 201b. of cotton seed oil, 41b. of coal oil, 30oz. of sulphuric acid, 21b. of bicarbonate of soda, 11b. of nitrate of soda, 15lb. of coal tar, 51b. of asphaltum, 41b. of litharge, 11b. of calcined magnesia, and 81b. of sulphur. For what are termed semi-hard rubber goods, the patentee employs 241b. of linseed oil, 161b. of cotton seed oil, 41b. of castor oil, 12oz. of sulphuric acid, 12oz. of nitric acid, 11b. of blcarbonate of soda, 11b. of sulphur and 11b. of calcined magnesia. For hard rubber goods, the mixture consists of the following:—321b. of linseed oil, 81b. of cotton seed oil, 31b. of castor oil, 11b. of coal oil, 24oz. of nitric acid, 6oz. of muriatic acid, 41b. of coal oil, 24oz. of nitric acid, 6oz. of muriatic acid, 41b. of bicarbonate of soda, 21b. of muriate of tin, 31b. of coal tar, 51b. of asphaltum, 11b. of gutta-percha, and 101b. of author.—Patent completed.

2405 J. F. LACKERSTEN, Cannon-street. Preserving food. Dated July 31 1868. gredients which compose the compound for the purpose 2405 J. F. Lackerstren, Cannon-street. Preserving 2405 Dated July 31, 1868.

For this purpose the reference 2405 Preserving 24

2405 J. F. LACKERSTEN, Cannon-street. Preserving food. Dated July 31, 1868.

For this purpose the patentee employs a receptacle in which is placed the substances required to be preserved, through an opening provided with a door or cover, which, when closed, forms a tight joint, and thereby, in a manner, hermetically seals the receptacle, to which are applied suitable safety and pressure gauges. In connection with such receptacle, an apparatus is employed for generating carbonic acid gas. Two strong vessels provided with suitable covers are made of any desired material and strength; these vessels are connected together at their lower parts by a pipe or tube, and at their upper parts by another pipe or tube, to which a stop cock is applied in order to cut off the communication between the upper parts of such vessels when required. In one of these vessels any suitable acid (sulphuric acid by preference), the level of the acid, when not acting on the carbonate, being maintained at a point slightly below the bottom of the carbonate. Another pipe passing from the upper part of the vessel in which the carbonate is placed dips into a vessel containing water, the upper part of such vessel, above the water level, being connected to the safe by a pipe or way having a stop cock applied thereto.—Patent completed.

2406 P. N. J. NARCISSE, Paris. Feeding botters. Dated July 31, 1868.

water level, being connected to the safe by a pipe or way having a stop cock applied thereto.—Patent completed.

2406 P. N. J. NARCISSE, Paris. Feeding botien. Dated July 31. 1868.

The feeding apparatus is applied to act automatically to fixed boilers. Two cylindrical chambers or receivers are maintained or supported at their upper parts by a bent double lever oscillating in two gudgeons, placed one on each side of a vertical column. At their lower parts, these two receivers each carry a socket with two compartments, articulated by means of two stuffing boxes to two square tubes or right angle bends acrewed to the extremities of two tubular arms fixed on the valves on either side of the before-mentioned column, these arms forming with the bent lever a parallelogram which always keeps the receivers in a vertical position. One of the two compartments of the sockets, that which receives the steam, is prolonged upwards within the receivers to nearly their tops by a tube or dip pipe. The other compartment, which receives the water, opens at once into the bottoms of the same compartments. The two valves fixed to the tubular arms oscillate in two sockets fixed on the square base of the column, which sockets have double compartments and four orifices; they distribute the water and steam separately and alternately in the two receivers. These two lower communicating with the dome of the boiler, and giving entrance to the steam into the apparatus, and the two upper allowing the escape of the steam into the atmosphere, or preferably into the feed water reservoir.—Patent completed.

2407 B. Sharpe, Hanwell-park. Shipe and batteries.

atmosphere, or preferably into the feed water reservoir.—
Patent completed.

2407 B. Sharpe, Hanwell-park. Ships and batteries.
Dated July 31, 1868.

In mounting great guns, instead of the usual gun carriages, two guns are attached to the opposite ends of a framework of twood or metal, in such a manner as will permit them to revolve in a vertical direction when secured to a ber of metal or wood passing between, the whole of which being also made to move in a horizontal direction, on wheels, attached to a framework of wood or metal, which framework in the case of ships, supports a deck, and, in the case of batteries, a protective covering of wood, metal, and other substances. The framework of the vertical motion has at other times the axis on which it revolves supported by another framework, resting on a centre, and turning horizontally on this centre, and on wheels placed under it, while it is kept in position by a lateral framework revolving on wheels and supporting a deck or covering. The framework for the vertical motion is made of a sufficient length to enable one of the guns at one point of the revolution to appear at such a height above the deck or covering, either for protection or for being fired with a sufficient degree of depression, and at another point as will allow both of the guns being placed under the deck or covering, either for protection or for being loaded, the aperture in the deck or covering through which the guns alternately appear and disappear, being then closed by a covering of wood, metal, or other substance, with a port on hinges attached to the vertical framework, and revolving with it.—Patent completed.

2408 G. D. Kittok and P. Brotherhood, Clerkenwell. Cooling fluids. Dated July 31, 1868.

framework, and revolving with it.—Patent completed.
2408 G. D. KITTOR and P. BROTHERHOOD, Clerkenwell.
Cooling Ruids. Dated July 31, 1868.

The object sought to be attained by this invention is to secure a great length of run for the fluids, so that the matter to be cooled, heated, or tempered is kept for a long time exposed to the influence of the liquid which acts upon it, and, at the same time, to provide facilities for cleansing the tubes. The patentees provide a number of tubes, and enclose each of them within another tube of larger diameter, the inner tubes being intended to receive the hot matter to be cooled, and the annular space between being intended to receive the water used for cooling. The double tubes are arranged in rows, tier above tier, and form communications. The wort or liquid to be cooled enters the first of the top inner tubes, and circulates backwards and forwards and downwards through all the tubes in succession to the lowest row, whence, after

completing its circulation, it finally issues,-Patent abo

2409 H. MOULE, Dorset. Feeding furnaces. Dated July 31.

2409 H. Moule, Dorset, Feeding furnaces. Dated July 31, 1888.

This consists of a grate (somewhat like an ordinary grate, but with the bottom removed) fitted upon a watertight reservoir or cistern of segmental form, in cross section, and of a width corresponding with that of the grate. This cistern constitutes the hopper for receiving into the liquid matter which it contains the coals, coke, shale, or other solid matter to be burned. The cistern or reservoir is conveniently made of cast iron with a flange at back to allow of the attachment of the grate thereto, and with ribe or corrugations to facilitate the traverse of the solid fuel through the cistern. In the line of the axis of the curved cistern is mounted a swinging propeller formed of pronga, arranged all in the same plane, and projecting from a transverse shaft mounted in suitable bearings within and external of the cistern. The propeller is intended to sweep over the bottom of the cistern with coal. The propeller is first raised on its trunnions, and the coal being thrown in the propeller is let down in rear of the charge, and, being pressed upon it, the fuel will be caused to slittle forward and rise to the required level in the grate. This being effected, the upper surface of the fuel is ignited in the ordinary manner. Waste water is poured into the cistern, upon or with the coals, and is kept up to a proper level in the cistern by additions thereto from time to time as it is evaporated. The coal or coke as it is pressed up into the firejace by the movement of the propeller will be coated and impregnated with the liquid, which, on coming in contact with the heat, will be reduced to its constituent gases, and, being then consumed, will add to the intensity of the fire. As the fuel burns away, the plunger is caused to press upward a fresh supply from below—Patent completed.

2410 R. E. DRINHAUS, Strand. Surgical instruments.

from below.—Patent completed.

2410 R. E. DRINHAUS, Strand. Surgical instruments.
Dated July 31, 1868.

The instrument consists of a metal disc, from the face of which projects a number of needles of equal length. It is enclosed in a casing provided with a hollow stem, through which passes a spiral spring; the spring terminates in a handle which projects from the end of the stem. The operation of the instrument is as follows:—Having removed the needle cover the open end of the instrument is applied on the skin at the part required. The handle is then drawn out from the stem until the spring is sufficiently extended, when the handle is suddenly released. The reaction of the spring will project the disc and needles forward, causing the latter to slightly puncture the skin where applied. The epidermis thus prepared will be ready for the application of oil or linament, which is painted over the punctured part by means of a feather or soft brush.—Patent abandoned.

2411 W. W. LYMINGTON, Somerset. Cutting up sugar.

is painted over the punctured part by means of a feather or soft brush.—Patent abandoned.

2411 W. W. Lymington, Somerset. Cutting up sugar. Dated July 31, 1868.

The apparatus is composed of standards, connected to form a bearing for a driving shaft. Below this driving shaft, and between the standards, is placed a knife, fixed to a block working in guides, having an up and down motion imparted to it. Below the knife, and opposed to it, is placed a second knife, also fitted to work in grooves, by means of a transverse plate passing through the knife block. This transverse plate works in grooves in the standards, and has an inclined upper surface, which is received in a corresponding groove in the knife block. In front of the standards, and at one end of the machine, is placed a tray mounted on a framing, upon which the tittlers or loaves of sugar are placed. Beneath this tray is an endless chain passing round pulleys, mounted near either end, which chain is provided with two or more fingers, projecting upwards through a longitudinal slot in the bottom of the tray, which, on the chain pulleys being rotated, move in the direction of the vertical knives, carrying with them the loaf or loaves placed on the tray. When the lower knife is in its lowest position, and the cupper knife is raised, a loaf of sugar is placed on the tray in front of a finger or feeder, its base projecting over the edge of the lower knife on which it rests. At each revolution, of the driving shaft, the upper knife descends, detaching a slice or disc from the end of the loaf, the latteneng advanced by the finger the thickness of a slice at each revolution. As the diameter of the loaf decreases, the lower knife is caused to rise by means of the vertical shaft and inclined slide before mentioned, so as to constantly maintain the upper side of the loaf in a horizontal position for insuring a uniform penetration of the upper knife.—Patent abandoned.

2412 A. F. Leale, Soho. Boilers. Dated July 31, 1868.

2412 A. F. LEALE, Soho. Boilers. Dated July 31, 1868. The patentee proposes to prevent incrustation in boilers by placing in the said apparatus any fibrous substance, such as tow or hemp. To the outside of the boiler a pipe of large diameter is connected, one end of which is fixed underneath the boiler, near one end; the other end of the pipe is fixed near the opposite end of the boiler at the level of the water; the pipe will thus assume a slanting position. Within this pipe is a perforated or wire gauze pipe filled loosely with fibrous material. As crew cap secures the same steam-tight in the outer pipe. There are cocks fitted for shutting off the communication with the inside of the boiler when it is required to remove the fibrous material, which can be done, and fresh fibrous material be replaced without stopping the working of the boiler.—Patent abandoned.

2413 H. MORITZ and J. Devented the contraction of the boiler.

2413 H. MORITZ and J. REINACH, Berlin. Planing files.

2413 H. MORITZ and J. REINACH, Berlin. Planing files. Dated July 31, 1868.

A planing cutter is firmly piaced in a stock on the upper part of a frame, and above the file to be planed; the file is conducted beneath it in a curved path, so as to bring the varying level or taper of the file under the cutter. In the frame, parallel rocking bars are set on axles, and their ends meet endway underneath the plane. The elevation of these rockers is regulated by a crank and shaft turning a vertical bevel wheel gearing with a horizontal bevel, actuating a vertical ecrew shaft which elevates and depresses the rockers, above which the sliding carrier gripping the file is set, such carrier being moved with a reciprocating motion, after the manner of an ordinary metal planing machine. The gripper consists of two claws or clamps compressed together or widened by a screw so as to enable them to grasp the varying lateral taper of the file. The grippers are caused to rise and fall to suit the thickness of the file by ordinary adjusting screws. The requisite pressure of the plane steel upon the file is produced by a lever pressing upon a sliding holder in the stock.—Patent completed.

2414 H. MORITZ and J. REINACH, Berlin. Cutting fles.
Dated July 31, 1868.
In this machine the hammer or cutter is set on an axis which oscillates so as to cause the hammer to rise and fall by a tappet motion and cut the file which travels underneath the cutter backwards and forwards, so as to effect the cross or angular reversed cuts or grooves in the file.—Patent completed.

2415 G. HARVEY, Birmingham. Collar holder. Dated July 31, 1868. This consists in constructing metallic holders of two This consists in constructing metallic bolders of two parts, the back forming an open loop for passing over and riding on a button or stud; it is secured on the back of gentlemen's neckties, and may be applied or removed at pleasure by the loop at the back being passed over the stud or button of the shirt collar. The back loop is connected to an ornamental front bar capable of receiving settings of precious stones, or other ornamental devices by means of a hinge joint.—Patent abandoned.

2416 A. TAYLOR, Birmingham. Brooch fastener. Dated

2416 A. TAYLOR, Birmingham. Brooch fastener. Dasca July 31, 1868.

The patentee purposes confining within a spring hook the brooch pin point; it passes down on the side of the free end of a guide bar, and pressing on the exterior of a spring hook, which, yielding to pressure, allows the free end of the pin to pass down, when the force of a spring in connection with the hook forces the hook outward until it is in contact with the guide bar, when the pin will be secured. To free the same, the pin has again, in like manner, to be pressed against the guide bar and the curved end of the hook, which will yield, and permit the end of the pin to be freed in order that the brooch may be removed at the discretion of the user.—Patent abandoned.

2417 J. HEATON, Derby. Treating cast from. Dated ply 31, 1863.

July 31, 1868.

The patentee claims the production of refined or of purified cast from by the employment of nitrate of soda or nitrate of potash, or mixtures of the same, either alone or in conjunction with a blast.—Patent completed.

2418 J. HEATON, Derby. Producing steel. Dated July 31,

1868.

This relates to the production of steel, and consists in the employment for such purpose of the purified or refined pig or cast iron, or the combination of iron and carbon, such as results from the action of nitrate of soda or nitrate of potash upon cast iron, when in a moiten state, either alone, or in conjunction with a blast, and contained in a converter, together with metallic iron, such as sponge, scrap, bar, or other form of metallic or malleable iron.—Patent completed.

Patent completed.

2419 T. Hunt, Hammersmith. Breech-loaders. Dated July 29, 1868.

The gun berrel is made in two separate parts; one consists of so much of the breech end as will contain the charge and shot, and the other is the remainder of the barrel. The outside of the "firing chamber," towards its rear end, is screwed to fit into a pivot or trunnion nut, the trunnions of which work in two check plates, one on each side, secured to the rear of the barrel and the stock. The object of the screw is to insert and release the front end of the "firing chamber," from the rear end of the barrel, and the trunnions enable the firing chamber, when so released, to partly revolve vertically, so that its open end may be elevated clear above the barrel, sufficiently to enable the empty cartridge case to be removed and the gun reloaded. By a side pressure of the finger or thumb on the wing or projection, attached to the front end of the firing chamber, the latter makes about one-third of a revolution, and the pitch of the screw is so made that the movement is sufficient to release or insert it from the barrel, after which the rear end of the firing chamber is depressed, until it disengages the cartridge hammer, which, being actuated by a spring, and having a projecting pin, which enters the circular hole, in the end of the firing chamber, strikes out the empty cartridge; the hammer is then withdrawn, a new charge put in, and the front end of the firing chamber inserted into the guide cylinder, and, by means of the screw, effectually tightened up to prevent any escape of the explosive gases past the point of junction.—Patent abandoned.

doned.

2420 J. E. OUTRIDGE, Isle of Wight. Stide calres. Dated August 1, 1868.

This relates to a peculiar construction and arrangement of mechanism, whereby the pressure of steam and vacuum is removed from slide valves, and their free working obtained without friction upon their faces. This is accomplished by attaching to the ordinary valve box of a steam engine, an apparatus, consisting of one, two, or more castings, each casting containing ports or passages for the inlet or outlet of the steam. The faces of the castings which contain the norts or massages are opposite to each other, and or outlet of the steam. The faces of the castings which contain the ports or passages are opposite to each other, and may be fixed parallel to each other, or otherwise. Between these faces, a single or double slide is placed, each of which has an aperture in it, whereby the communication from passage to passage is perfectly free. When a double slide is employed, blades of brass or other metal are placed upon the part or parts of the slide exposed to the steam, to prevent a passage between the two slides or parts. A lever affixed to the slide rod will keep the valve or valves to their faces.—Patent completed.

races.—Fatent completed.

2421 C. J. L. Nicholson. Thredneedle-street. Preserving food. Dated August 1, 1868.

This consists in fitting to the tops of cans for preserving food a plate, having a screw passed through it; a disc of elastic material is placed under this plate, and a guide pin depend therefrom. This pin serves to guide a second plate, placed inside the can, and which the screw draws up against the inside of the can and elastic disc, in order to make a close joint.—Patent abandoned.

2422 J. A. MCKEAN, Paris. Eyelet machinery. Dated narust 1, 1868.

2422 J. A. McKean, Paris. Eyelet machinery. Dated August 1, 1868.

This consists chiefly in the peculiar combination of dies, punches, and cutters, whereby the several operations, which each eyelet has to undergo, are performed simultaneously, in different sections of the machine, so that any desired number of eyelets may be finished in the same time that would be required to produce one single eyelet. Reciprocating punches are arranged in combination with rotating cylinders, perforated with series of holes to give the eyelets the required form, in the successive stages of their manufacture. The eyelets are produced from strips or sheets of brass or other metal, and each strip is first subjected to the action of one series of dies and punches, and is then passed under the next series, and so on, until brought to the required form, while, at the same time,



fresh strips introduced between the first set of dies and punches, follow the strip first introduced. Each strip, as it passes from the last series of dies, is brought into co with a cutting cylinder, which removes the ends o eyelets. The strips are annealed between the succe operations.—Patent completed, asses from the last series of dies, is brought into contact

2423 M. SAMUELSON, Hull. Hydraulic boxes, Dated August 1, 1868.

This relates to improvements in hydraulic press boxes, such as are in ordinary use in oil mills, and consists in the employment of wrought iron or steel in combination with cast iron, for the purpose of strengthening the same.—Patent abandoned.

2424 M. WILKINS and J. CLARK, Paddington. Boilers and

2424 M. WILKINS and J. CLARK, Paddington. Boilers and furnaces. Dated August 1, 1868.

The patentees form the boiler of a number of plates or sheets of metal, joined two-and-two round their edges, either by rivets or welding. Through these plates, holes are drilled about 8in. apart; ferrules or distance pieces are placed between them. The plates are arranged vertically side by side, with corresponding ferrules or distance pieces between each pair, they are bound together by binding bolts passing through the centre of the ferrules, and embracing the outside plates of the series. Water to supply the evaporation of the several cells is conducted along the centres of the ferrules, from a larger division or cell at each side of the boiler, and passes by holes in the ferrules to the several cells. In like manner, the steam is conducted to a steam chest or chamber, which may either be on the side or top of the boiler. The ferrules are made considerally larger than the diameter of the binding bolts, so that the water and steam may have free passage around the bolts, but where a passage for water or steam is not required, the ferrules are just so large as to allow the binding bolts to pass through their centres, and prevent the plates collapsing when the bolts are screwed tight.—Patent completed.

pleted.

2425 A. Arnold, Birmingham. Button fastener. Dated August 1, 1868.

This consists in forming the one part of the fastening, termed the back portion, with a socket or section of a tube secured to or upon a plate of suitable form. The second part or fastening piece consists of a shank secured to or upon a plate or stud, or to a portion of the article, and it is formed with a ball-shaped end, and is also split up from its bottom or ball shaped end towards the top or head, so as to act as a spring, and pass into the socket or tube upon the back plate, thus effecting the fastening of the two parts or ends of the article required to be secured. To free or disconnect the two parts, it is merely requisite to pull each end with a slight degree of force, which will cause the split shank to slide out of the socket or tube.—Patent abandoned.

2426 C. GEOGHEGAN, Dublin. Water regulators. Dated

Patent abandoned.

2426 C. Groghegan, Dublin. Water regulators. Dated Angust 1, 1868.

The object of this is to admit water or other fluids into elsterns or reservoirs in buildings at high pressure, and maintain it at all times at a fixed level, so that as soon as the water is drawn off by any outlet from the reservoir it refllis itself, the cock closing at the ordinary standing level in the cistern. Inside the cistern is fixed an inverted air vessel, with an open bottom fixed below the surface of the water at standing level, having an aperture at the top, connected with an air tube of small bore, carried down to the top of a closed vessel, having an aperture at the top and bottom only, the air pipe being attached securely to the upper aperture, and the bottom aperture being united to a vessel in a similar manner; this vessel has an open top in which water is allowed to stand at a fixed level until acted upon by the condensed air.—Patent completed.

2427 G. Wilson, Elgin. Ships' logs. Dated August 1,

2427 G. WILSON, Elgin. Ships' logs. Dated August 1,

This consists, in the first place, of a circular brass box, supported by and moving horizontally in a strong brass frame with turned-up ends, and of a cylinder with conical ends, one end having an universal joint attached, and the other a watertight screw plug. The motive power is on another cylinder of less length, and freely movable on the outside. This outer cylinder has cast upon it twelve vanes, which gives it the necessary motion in the sea, the vanes being obliquely placed. The outer cylinder is adjustable on the inner cylinder, to cause it to run deeper or less deep in the sea. A line of fine wire forms the connection between the motive power or cylinder and the ship, and gives motion to the machine on board.—Patent completed.

2428 J. SCOTT. Sheffield. Cattle food. Detect August 1

2428 J. Scorr, Sheffield. Cattle food. Dated August 1

1868.

The patentee takes grain of any kind suitable for any given class of animals, and grinds it; he then mixes bran, chopped hay, or straw or chaff, or other cheap ingredient; the mixture is then made into a paste with water, in which a little salt is dissolved. The paste is formed into cakes or loaves, and baked. Or the paste may be fermented with yeast or bran before being baked. The preparation or food is fit for use when broken or crushed. The proportions in which they are mixed vary according to the kind of animal to be fed.—Patent completed. pleted.

2429 H. O. ROBINSON, Glasgow. Dredging machine.

2429 H. O. ROBINSON, Glasgow. Dredging machine. Dated August 1, 1863.

The operation of dredging is performed by a spiral or helical cutter placed in a cylinder, both of them revolving together. A tube is connected to the cylinder through which the material so ascends up out of the water. The cylinder with the helical cutter is placed in a floating vessel in an inclined position, as in the common dredger, and driven by an engine. The action of the helice on the fluid material is to force it upwards through the tube, but in order to insure its ascent out of the water to any desired height, screw propellers are made to rotate within the tube, or the air in the tube is exhausted by any of the usual modes. The helical cutter or instrument thus constructed and placed is drawn or uryed against the bottom usual modes. The netical cutter or instrument thus constructed and placed is drawn or urged against the bottom by a ferward motion given to the vessel in the usual way. Patent completed.

2430 S. PLIMSOLL, Sheffield. Loading coals. Dated August 1, 1868.
This is chiefly applicable for transferring coals from railway trucks into barges. A shoot is provided sufficiently wide to receive the contents of two or more railway trucks to be unloaded at the same time. This is effected by bringing each truck over an aperture above the shoot, into which the coals are emptied from the

bottom of the truck. At the lower end of the inclined bottom of the truck. At the lower end of the inclined shoot are hinged flaps, which are provided with raised sides, and supported in a horizontal position by chains and pulleys, by the aid of which the hinged flaps may be inclined at any angle to the shoot desired. A wedge-shaped central division is placed near the lower end of the shoot to guide the coal on to the flaps. Two or more hinged doors or gratings are suspended in the inclined shoot (between the aperture through which the coals are received and the flaps), for the purpose of checking the coal in its descent.—Patent completed.

2431 J. R. Chonsky Canon-street. Looms. Dated

coal in its descent.—Patent completed.

2431 J. R. Caoskey, Cannon-street. Looms. Dated August 1, 1863.

This relates to shuttles driven by compressed air, by intervening between the shuttle box and the second wheel a flexible barrel or cylinder composed of rubber or canvas and discs of wood, from which air is forced on pressure being applied to one end, a valve opening at the other at the same time, the air rushes through the valve and shoots the shuttle through the shed of the warps.—Patent abandoned

doned.

[The granting of a patent to the applicant was refused by the Attorney General, on account of the particulars having been obtained by fraud.]

2432 L. C. BAILEY, War Office. Drawing pens, Dated August 1, 1868.

August 1, 1888.
The set screw is formed with a head, divided into radial spaces, with numbers thereon, after the manner of a scale. A cut on the upper blade close to the screw head forms a medial line with the centre of the pen, by which means the position of the screw and its divisions in relation to the fixed medial line will always serve to indicate the space between the points of the blades, so that the exact fineness or thickness of line can be drawn.

—Patent completed.

—Patent completed.

2433 G. M. SHORE, Dorset. Railway brakes. Dated August 1, 1868.

In order to increase the hold of the brake block upon the wheel, and also of the wheel upon the rail, and also to prolong the time during which a brake block will last, the patentee places in the face of the wooden brake block nails, screws, pins, bolts, or pieces of metal, by preference of chilled cast iron or steel. When the heads, ends, or tops of these nails are brought into contact with the tyre of the wheel, they give to it a slightly roughened surface, thereby increasing the hold of the brake block upon the wheel, and also of the wheel upon the rail or block.—Patent completed.

2434 G. T. BOUSFIELD, Brixton. Binding skirts. Dated

2434 G. T. BOUSFIELD, Brixton. Binding skirts. Dated August 1, 1868.

This relates to the binding of ladies' dresses, and consists of a binding material that presents an edge of indiatubber, or other flexible material impervious to water, below the edge of the skirt, to protect the same from wear by contact with the floor or ground.—Patent completed.

by contact with the floor or ground.—Patent completed. 2435 S. R. RENAUDIN, Strasbourg. Battery. Dated August 3, 1863.

The object of this invention is to protect troops from the fire of an enemy, and at the same time admit of their returning it whilst under shelter. It consists of a species of sheet iron presenting a concave surface or surfaces to the enemy, so that the shots striking them are repelled in the direction from whence they came. When consisting of more than one sheet of iron, they are made in two pieces precisely similar, and mounted on wheeled carriages having two wheels each, and are made to fold so as to having two wheels each, and are made to full each as a to facilitate their transport, and all alike when raised in position. They are to be supported by props or stays.—Patent abandoned.

position. They are to be supported by props or stays.—Patent abandoned.

2436 H. W. GARRETT and G. HOLCROFT, Manchester.

Firearms. Dated August 3, 1868.

This consists, first, in an improved mode of opening and closing the cartridge chamber. The patentees employ a sliding bolt, which has a longitudinal to-and-fro motion given to it by the operator in opening and closing the cartridge chamber. The sliding bolt is cylindrical, and its in the end of the barrel; a handle projects from the sliding bolt, the shank of which handle its in a recess in the barrel to lock the bolt when the cartridge chamber is closed, and a partially rotatory motion is also given to the sliding bolt to lock and unlock it. Second, in an improved mode of discharging the cartridge, consisting of the application of a triangular block or wedge placed between the end of the spindle of the nipple and the horizontal striker, which slides within the sliding bolt above referred to, and is provided with a spring to draw it back. By this means, when the hammer strikes the nipple, the triangular block or wedge transmits the motion to the horizon-al striker, and explodes the cartridge. Third, in an improved mode of applying a spring catch for drawing the cartridge case out, or partly out, of the barrel. This catch is acted upon by the sliding bolt, and when the bolt is drawn back to open the cartridge chamber, the catch comes against the edge of the cartridge case, and draws it back until it is at liberty to fall out of the cartridge chamber.—Patent abandoned.

2437 C. Wilson, Hull. Reging and furling sails. Dated August 3, 1868.

back until it is at liberty to fall out of the cartridge chamber.—Patent abandoned.

2437 C. Wilson, Hull. Reefing and furling sails. Dated August 3, 1868.

This consists in fitting to the inner end of the boom a forked socket having a hole for a pin to pass through. This pin is riveted or burred down inside the socket to allow the boom to revolve. The outer end of the pin is jointed to a second pin or bolt, which enters rings or collars fixed on the mast. A socket fits over the inner end of the boom, which socket forms part of a worm wheel. This wheel is geared into by a worm on a spindle having a crank handle or other appliance for turning it fitted thereto. On the outer end of the boom a collar is fitted which carries a loose ring so that the boom may turn freely. This collar has two or more other rings placed on it which act as friction rings, and other friction rings are fitted over the socket on the inner end of the boom. The worm wheel and worm may be enclosed in a casing so as to prevent any ropes fouling the same. To each of the hoops which travel up and down the mast a ring is fitted, having a portion removed or cut away so as to prevent any ropes fouling the same. To each of the hoops which travel up and down the mast a ring is fitted, having a portion removed or cut away so as to prevent any ropes fouling the same. To each of the sail to enter. The luff rope to which the sail is secured is passed into these rings, and is held therein by the cut away portion net being large enough for the rope to pass out of it.—Patent abandoned.

2438 T. Wardle Leeds. School desks. Dated August 3, 1868.

This relates to the upper part of the desk, which is used.

same with the form or board upon which the person using the desk sits. Instead of fixing such upper part of the desk rigidly at a fixed angle, the patentee fixes the same on hinges, so that the part of the desk which slopes when used as a writing desk can be made to assume a position forming a horizontal table, or the half of a table (if two desks be placed together) or to assume an upright position as a back to the seat, in which case the sitter will be seated in the contrary direction to that he would take when writing. The hinges employed are of a peculiar form, so that the centre of motion or the pivot on which the levers turn is placed at a distance of about 3in, from the face of the hinge, affixed to the board, and the two portions forming the hinge are cut in a circular pattern, so as to permit of two portions convenient for affixing stops to be in juxtaposition in each required position of the hinge. A pin is passed through one part of the hinge and engages in three holes in the other part of the hinge, so that when the pin is engaged in the first hole the board affixed to the hinge is in position nearly upright, so as to form a convenient back to a bench; when in the second hole, such board is at a convenient; shop for writing, and, from the form of the hinge, has travelled through such a space as not to overlap the seat more than is convenient; and in the third hole the board becomes flat and forms a narrow table, and two of such benches being placed together, at table of a useful breadth is formed.—Patent completed. same with the form or board upon which the person using

2432 W. Spence, Chancery-lane. Treating ores. Dated

2432 W. Spence, Chancery-lane. Treating ores. Dated August 4, 1868.

The ores are first ground and intimately mixed with a suitable proportion of iron pyrites. This mixture is heated by superheated steam in a rotary cylinder. The heated or roasted ores are then amaigamated by a simple process of trituration, with a suitable proportion of mercury, but without the addition of any reagents. The triturating apparatus consists of a circular trough, within which four grinding stones revolve. Rakes and scrapers are arranged so as to act between them. The next part of the process is the separation of the amalgams. This is followed by the compression of the mercury for separating a great part of the free mercury. The remaining operations, consist of the distillation of the mercury, the precious metals, and the treatment of the residuums, which are conducted as usual.—Patent completed.

2440 H. A. BONNEVILLE, Paris. Preceiving meat. Dated

2440 H. A. BONNEVILLE, Paris. Preserving meat. Dated August 4, 1868.

August 4, 1868.

The meat is first deprived of its marrow bones, and then wiped and pressed in linen, so as to do away with the blood and moisture, and then, in order to cosqulate the albuminous substances, it is heated in an apparatus provided with a double perforated bottom, on which the bits of meat are placed, and underneath which water is made to boil. Sometimes the patentee preserves the meat without applying heat; in this case, it is besprinkled with powdered saltpetre by means of a sieve, in the proportions of about 1-300th of the weight of the meat, after which it is covered over with a layer of olive oil by means of a brush, and then placed in bags and pressed, to render it firm and compact in the animal charcoal. It is arranged in layers of animal charcoal, broken to the size of peas. This charcoal absorbs the air and the gases exhaled by the meat. The apparatus for the meat is internally divided by perforated sheet iron diaphragms resting upon annular ribs, placed at a distance of about 6jin, from one another.—Platent completed.

2441 H. A. BONNEVILLE, Paris. Dyeing fabrics. Dated The meat is first deprived of its marrow bones, and then

6 jin. from one another.—Patent completed.

2441 H. A. Bonneville, Parls. Dyeing fabrics. Dated August 4, 1863.

This relates to the use of pumps in lien of hand labour, in order to perform the various operations preliminary to the dyeing, the dyeing process itself, and the drying of the textile materials. To that effect, one or several troughs are used containing the liquids employed in these different operations, and a special trough is used, in which is suspended the textile material to be treated. This trough is furnished with a false perforated bottom and its hollow lid, the bottom of which is also perforated. This hollow lid and the trough, below its false bottom, are put into communication by means of pipes with the other troughs, and numeration by means of the switch the other troughs, and according to the nature of the operation to be effected, the liquid of one of the troughs is sucked by a pump and forced into the hollow lid, whence it flows upon the materials.—Patent abandoned.

2442 A. L. HOFFMANN, Poplar. Ships' yards. Dated August 4, 1868.

The yard is formed of metal, and hollow, to contain the roller, to which the upper edge of the sail is made fast. The sail passes from this roller through a longitudinal slit or opening provided for it along one surface of the yard. Theyard maybe strengthened by quarter battens, and otherwise, and there also may be quarter strengtheners to aid in the support of the roller sqainst bending, if desired. Reeding chains or cords are wound around the ends of the roller, in order that when they are drawn upon to cause the rotation chains or cords are wound around the ends of the roller, in order that when they are drawn upon to cause the rotation of the roller the sail may be wound thereon. The surface of the sail may be increased when the sail is made fast to another yard, or otherwise, at its lower end, by simply raising the yard, by halyards, or otherwise, until the desired amount of sail has been given out. The sail may be tightened up by drawing on the reeting cords.—Patent abandoned.

2443 R. SCHOMBURG, London-street. Brick machinery.

2443 R. SCHOMBURG, London-street. Brick machinery, Dated August 4, 1868.

This consists of a pug mill of the ordinary construction mounted above a series of moulds, which are placed in a circular or rectangular framing. The clay or other material is forced down to the lower part of the pug mill, where it enters moulds carried upon a circular table, which has a rotary motion communicated to it in any suitable manner. Beneath the table a wheel or drum is placed, upon which the bottom of the moulds are brought to bear in their rotation. This wheel causes the moulds to rise so as to bring the upper surface against the under side of a fixed table or plank; in this operation the clay becomes compressed within the mould; the moulds with the material within them then pass on towards a second wheel or drum, by which the bottom of the mould is lifted, so as to cause the moulded articles to project beyond the top of its mould, it can then be removed to a drying stack, or if the clay is sufficiently free from moisture, it can be stacked or otherwise treated for burning.—Patent abandoned.

2444 B. J. B. Mills, Chancery-lane. Harcesting machines.

the cut away portion n-t being large enough for the rope to pass out of it.—Patent abundoned.

2438 T. Ward, Leeds. School decks. Dated August 3, 1868
This relates to the upper part of the desk, which is used or writing or supporting a book, and which is usually attached to an upright piece of wood, connecting the



towards the cutters, whilst one or more of them are, in addition to gathering the standing crop towards the cutters, caused to sweep the cut crop off the platform, the others being caused to travel above the platform clear of the cut crop thereon, cams being used to impart the various motions to the rakes or beaters, and this part of the invention consists in making a portion of the cam way opposite to the platform which guides the rakes or beaters which gather, but do not discharge the crop, movable, so as to cause the arms of any one of these heads or beaters to descend on to the platform and become a discharging rake by following the auxiliary cam for the time being the movable cam way at the will of the driver, instead of the driver directly operating the movable cam way. This arrangement prevents the roller at the heel of the rake arms from ever coming in contact with the point of the movable cam way, and prevents the possibility of two revolving arms next to each other in succession from following that cam way by which they would be made to discharge the cut crop from the platform.—Patent completed.

2445 C. F. C. CRETIN, Glasgow. Lamps. Dated August 4, 1863.

The interior of a gas lamp is provided with a burner which communicates by a pipe leading to a gas holder or reservoir from which the gas is supplied. The air necessary for maintaining the combustion of the gas enters the sary for maintaining the combustion of the gas enters the airtight gas tube by several holes or perforations situated around and below the burner. The carbonic and other products of combustion are drawn off by means of a fan or ventilator, so that the products of combustion are discharged at the outer extremities of the vancs. In this way, a partial vacuum is effected, and, consequently, fresh air descends the air pipe, and is supplied continuously to maintain the combustion of gas.—Patent abandoned.

2145 F. F. MANN. Publish. Figure 2019. Detail August 4.

2446 E. EVANS, Denbigh. Flour mills. Dated August 4,

2446 E. Evans, Denbigh. Flour mills. Dated August 4, 1868.

Three millstones are employed, set vertically. The middle stone is capable of rotation, while the other two are fixed. The rotating stone is provided with two grinding surfaces which are dressed as usual. Each of the grinding surfaces of the fixed stones has half its furrows draughted at different angles from the other half, for the purpose of accelerating the discharge on the ascending half and retarding it on the descending half. The rotating stone is driven by means of a pulley on its periphery, around which a band passes, the band taking motion from any prime mover. The outer or fixed stones are hung or mounted in universal joints or gimbals, the bearings of which are made capable of sliding longitudinally on the frame. Weights are suspended from the lower sides of the stones for balancing their grinding surfaces in a vertical position. The rotating stone is adjusted between the outer ones, and is mounted upon a horizontal shaft which passes through the eyes of the fixed outer stones, the said shaft turning in bearings. On the shaft of the rotating stone, and situated part within and beyond the eyes of the outer stones, are two worms, which worms work in casings which receive the grain from the hoppers. By the rotation of the shaft, the worms convey the grain through the casings in the eyes of the outer stones to the grinding surfaces.—Patent completed.

2447 J. FRAZER and W. NAAR, Bayswater. Mattresses. Dated August 4, 1868.

Dated August 4, 1868.

The upper surface of spring mattresses is so made as to set the head of the mattress higher than the foot. To this end, the mattress is made with a base and an upper frame connected together by springs. To the ends of the frames fastenings are employed for drawing the frames together, so that the foot of the mattress may be depressed and the head elevated at pleasure.—Patent abandoned.

2448 A. V. Newton, Chancery-lane. Boot swing machinery. Dated August 4, 1868.

This consists in making the table adjustable to suit various sized lasts, and in fitting the whole of the sewing apparatus above the table, and actuating the same by means of a treadle. A peculiar arrangement of mechanism is employed for working the needle, and a lamp for heating the thread on its way to the needle.—Patent completed.

pleted.

2449 F. W. Kitson and P. Chalas, Leeds. Priction clutches. Dated August 4, 1868.

This consists in forming one of the discs hollow, and fitting plungers or pistons through the face plate; the pistons are connected with a plate on the outside of the disc; on pressure being applied, the pistons are forced outwards, and the plate bears against the moving disc with sufficient force to compel it to follow its course. The water from the hydraulic pump, when water is used, is supplied to the main shaft, which is perforated for that purpose.—Patent completed.

purpose.—Patent completed.

2450 C. G. JOHNSON, Stockton-on-Tees. Brick machinery. Dated August 4, 1868.

A pug mill is employed in combination with boxes or moulds, set in a circular or rectangular table, revolving or milding reciprocatingly beneath an aperture in the pug mill, in such manner that the boxes or moulds are, by the movement of the table, brought in succession opposite the oritice of the pug mill, and are from it filled with clay, concrete, coal dust, or other substance, to be moulded into a block. When the moulds have been moved past the orifice of the pug mill the materials in the moulds are subjected to pressure, by a piston which forms the bottom of the mould being forced upwards by its lower end coming against an incline or cam surface, whilst the top of the mould is at this time covered over with a lid or plate. The bricks or blocks are subsequently discharged from the moulds by cams or levers, and are removed; it may be either by hand, or by appliances to push them off the table on to a creeper.—Patent completed.

2451 J. Hamilton, Holland. Artificial fuel. Dated

2451 J. HAMILTON, Holland. Artificial fuel. Dated August 5, 1868.

Atolerate Jan. Dated August 5, 1868.

The patentee takes about 20cwt. of "Duff" coal or other carbonaceous material in a pulverized state, and from lewt. to 4cwt. of stearine, pltch, palm oil, or other animal or vegetable residuums; these are mixed with from lewt to 3cwt of chloride of spolium, in the form of rock or other salt. The mixture of these ingredients is effected in a pug mill. In order to facilitate cohesion between the ingredients so combined, the waste substances resulting from the manufacture of farina or the silicates of soda or potash may be added thereto. The resulting compounds can then be formed into bricks or balls for use, as may be desired,—Patent abandoned.

2452 T. B. OSWALD, Sunderland. War ships. Dated August 5, 1868.

The patentee proposes to build a low vessel with only some 44ft. freeboard when all complete, which is to be made quite shot proof. On the deck of this vessel for half its length amidships and three-quarters its beam on deck an oblong battery is erected; the remaining space on deck is also bomb proof, whose sides and ends lay at an angle of 45deg, or thereabouts, more or less, and whose top is circular. This battery stands some 9ft above the deck, and is plerced at the two sides and ends for the largest size of guns. This battery is enclosed in a light but watertight spar deck, wherein the officers and crew have their accommodation.—Patent abandoned.

have their accommodation.—Patent abandoned.

2453 A. V. Newton, Chancery-lane. Iron and steel.
Dated August 5, 1868.

The first part consists in the use of a flux composed of manganese and common salt (chloride of sodium) in a moist or wet state, with limestone or shells, such flux being introduced into the furnace during and after the fusion of the metal, in order to decarbonize it and to cause the expulsion and carrying off of silicon, sulphur, phosphorus, and other impurities, and bring the iron to such a state that on its being simply cast into moulds it will have the character of cast steel without further manipulation, and may, when cast in ingot moulds, be subjected to the operations of hammering and rolling to reduce it to the form of bars of any required shape for the manufacture of tools or other articles requiring hardness and temper.—Patent completed.

2454 N. D. Spartall, Liverpool. Propelling vessels.

2454 N. D. SPARTALI, Liverpool. Propelling vessels.
Dated August 5, 1868.
Blasts of wind are produced from a blower, constructed on the turbine principle, discharging such wind into the water from the stern, or the sides of the vessel. This blower may be worked by a donkey or other engine, and the blast therefrom discharged into a serpentine pipe or pipes, which may terminate in a trumpet mouth for spreading the blast.—Patent abandoned.

2455 W. MILLARD, Trowbridge. Looms. Dated August 6,

1868.

The improvements are especially applicable to power looms for weaving check patterns, and have for their object the causing the shuttle boxes to stand more firmly to their work, and avoid tendency to kick; they comprise sinking, square, or rectangular, and circular, or partly circular grooves, in the back of the frame, holding the shuttle boxes, and providing guides of corresponding shape (or nearly so) working in such grooves. Also making the grooves and slides, or either of them, with the grooves sunk in the slay sword or vibrating upright, which carries the slay beam at one end, and into a cap securing slide at the other.—Patent completed.

2456 H. CHURCHMAN, Horsham. Boot cleaner. Dated August 6, 1868.

August 6, 1868.

This consists in constructing rotary brushes in the following manner:—A circular concave brush, the surface of which is formed round or concave at bottom, widening out to a certain point from which the brush surface again contracts towards the rim of the brush, it being made to extend partially or completely over such rim. By this form of brush, the boot is effectually acted upon in all parts, as the sole being made to fit into the widest point of the side surfaces, the front of the upper leather is cleaned by the concave bottom brush surface, while the sides of the boot are acted upon by the contracted side brush surfaces.—Putent completed.

2457 E. Enwards Wastminster. Pumns. Dated August 6.

2457 E. EDWARDS, Westminster. Pumps. Dated August 6,

2457 E. EDWARDS, Westminster. Pumps. Dated August 6, 1863.
This consists in making pumps with flexible rings instead of pistons or plungers, and flexible discs or plates for valves. For ordinary lift pumps, the patentee forms a tube, the upper part of which is expanded into a cup shape, and has a flange at the top. Upon this tube another cup having a corresponding flange is fastened. In the upper part of the lower tube, and in a recess just below the cup, a horizontal plate perforated with holes is placed, which forms the seat of a flexible valve; a bar is fitted having a per foration through it of sufficient length and depth to allow a disc of flexible material to be passed through it, which disc, being held down by the bar, but allowed to bend up on each side of it, forms a watertight valve opening upwards.—Patent completed.

2458 M. BENSON, Manchester-square. Indicators and

on each side of it, forms a wateright valve opening upwards.—Patent completed.

2458 M. Benson, Mauchester-square. Indicators and valves. Dated August 6, 1868.

This relates to an attachment to steam boilers, to serve as a safety valve, and give warning of a deficiency of water in the boiler, the valve is made large enough to provide it with an elbow chamber, for attaching tubing; one of the tubes is attached to the chamber, at the underpart of the valve, and its end extends down through the valve pipe or dome into the boiler, and a little below the proper level of the water. Another tube is horizontally attached to the side of the valve in the chamber, and on the outside of the boiler which communicates with the one before described. The horizontal tubes serve as a lever, and is bent up at its outer end, to which a globe or vessel for containing water is attached; the water in the globe serves as a weight for holding down the valve. The top of the globe is provided with a cock to let out the air when the water is forced into it from the boiler, which is done by the steam.—Patent completed.

2459 L. PRICE, Birmingham. Candistick slides. Dated

2459 L. PRICE, Birmingham. Candlestick slides. Dated

August 6, 1868.

This consists in making spring slides for candlesticks. A strip of iron is employed of greater length than that ordinarily employed, and the free side of the spring slide is made of greater length than usual. The lower part of the free side is carved into a nearly semicircular figure, the concave side of the curve being turned towards the other side of the spring slide. The bottom of the free side of the slide being bent inwards constitutes a stop which prevents the too great compression of the parts.—Patent abandoned. abandoned.

2460 W. PEARSON, and W. SPURR and H. BRADBURY,

2400 W. Pearson, and W. Spurr and H. Bradburt,
Birstall. Looms. Dated August 6, 1868.

This relates to self-acting means of working the rising boxes or change shuttle boxes employed in booms for wearing fabrics, for which jacquard or other indicating apparatus is used to select the different colours or kinds of weft required, and consists in the construction of apparatus whereby the indicating or governing apparatus may be readily "lagged back," reversed, or altered at any time without altering or otherwise moving any of the other parts of the loom. In one arrangement for this pur-

pose, the patentees employ the well-known "star wheel" intermittent motion. To the star wheel a barrel is fixed, on the surface of which are arranged a series of slidable tappets, equal in number to the number of points, places, or notches in the star wheel. These tappets are formed in steps or different lifts, two, three, or more, according to the number of change boxes used, and are arranged under the box levers, so that as the star wheel rotates (intermittently) the tappets may be placed in suitable position for contact with the friction roller of the lever, and thereby cause it to operate the boxes. The jacquard apparatus or peg lags or other indicating apparatus are arranged to operate upon these tappets by means of levers and rods, so as to slide the tappets into proper position, as required for contact with the box levers.—Patent completed.

2461 J Hargraves Durham. Iron and steel. Dated

as required for contact with the box levers.—Patent completed.

2461 J. HARGRAVES, Durham. Iros and ites. Dated August 6, 1863.

The patentee states that during the manufacturing of steel or malleable iron, by any of the processes, in which the carbon, silicon, and other impurities are removed by the action of currents of oxygen, ascending through fused cast iron, such, for instance, as the Bessemer, or where the conversion is effected by passing oxygen, by the action of heat and carbonaceous matter, such, for example, as the nitrates, chlorates, and manganates. Into the converting vessel or other apparatus, in which the cast iron is being operated upon by ascending currents of oxygen gas, or atmospheric air, or other compound, capable of evolving oxygen is projected, whether the said-compound of oxygen be in a gaseous, liquid, or solid condition. Instead of oxygen may consist of nitrate of soda, or nitrate of potassa, or chlorate of soda, or chlorate of potassa, or other salt, which yields oxygen, injected upon the surface of the iron, which is being operated upon as aforesaid, by ascending currents of oxygen. The patentee injects the oxygen gas or atmospheric air, or oxygen yielding salt or other compound, capable of evolving oxygen above the surface of the iron, and slag being operated upon by the ascending currents of oxygen or compound thereof, as aforesaid, downwards upon the surface of the iron, and slag being operated upon by the ascending currents of oxygen or compound thereof, as aforesaid, downwards upon the surface of the metal and slag, and it is further preferred that the gas or airor oxygen vielding salt, should be heated previous to being injected. The temperature of the converter is elevated by the combustion of the evolved carbonic oxide within the converter.—Patent completed.

2462 H. F. Freistel and H. Zox, Blackfriars-road.

-Patent completed.

2463 H. F. FREISTEL and H. ZOX, Blackfriars-road.

Hats and caps. Dated August 6, 1868.

The patentees propose to maunfacture the hat, cap. or other covering of a woven material, consisting of horse hair, or of hair mixed with cotton or other fibrous material, which may be of any colour or series of colours desired, or which may consist of a printed warp. The fabric thus woven is to be applied in a double layer to form the body of the article required. The fabrics when placed side by side are reversed in the direction of their warps and wefts, those of one fabric being placed in a position at or near a right angle to those of the other. It may be treated with any outer material or fabric, such as silk or other fabric, to form the exterior, in which case the effect of a blow or pressure upon the article will not be permanent, but will disappear by the spring of the compound hair fabric.—Patent abandoned.

#### [APPLICATIONS FOR LETTERS PATENT.

Dated February 15, 1869.

460 A. H. Lewis, Fenwicke-street, Liverpool. Improvements in extracting copper from its ores.

461 T. Hattersley, Leeds. Improvements in spindles and figers used in the spinning and preparing of flux, tow, hemp, jute, worsted, wool, cotton, silk, and other fibrous substances.

462 C. W. Lancaster, New Bond-street, Middlesex. A hollow wadding for breech-loading cartridges.

Dated February 18, 1869.

463 S. Shaw, Southampton-buildings, Chancery-lane. Improvements in devices for lacing and buttoning boots and shoes.

nd shoes. 464 T. Bond, Liverpool. Improvements in machinery be employed in the construction of casks. 465 T. Winder, Liverpool. An improved spring coupl-

10g.
466 H. Posen, Christopher-street, Finsbury. An improved fastening for purses, pocket books, belts, and

other articles.

467 T. Billyeald, Nottingham. Improvements in the manufacture of nets for ladies' hair.

468 W. Smartt, Buckhurst Hill, Essex. Using the heat which is usually under sitting room, office, and other similar fires, and which is thrown off from the said fires and from the hot ashes which fall from them, for cooking, warming and drein purposes.

and from the hot ashes which fall from them, for cooking, warming, and drying purposes.

469 L. N. Legras, Wardour-street. Improvements in the preservation and disinfection of animal and other substances, and in the apparatus employed therein.

470 V. A. Houdaille, Boulevard Sebastopol, Paris, Improvements in metallic burgs for pressure vessels or vas specially applicable to brewers.

471 G. W. R. Pigott, Halifax. Improvements in machinery or apparatus for the consecutive manufacture of various articles of commerce from materials capable of being formed either by tension, compression, or extension thereof.

B. J. B. Mills. Southampton-buildings, Middlesex.

472 B. J. B. Mills, Southampton-buildings, Mtddlesex. Improvements in brick-making machinery.
473 C. E. Brooman, Fleet-street, City, patent agent. Improvements in treating the waste of wool, silk, horn, and other nitrogenized animal matters to be used as manure. (A communication).
474 H. Tylor, Queen-street, City. Spring bedsteads.
475 A. M.Neile and J. Slater, John-street, Pentonville. Improvements in carriage wheels.
476 J. Fletcher, Bow. Improvements in feeding begass furnaces, and in begass furnaces, and in apparatus applied thereto.



479 J. W. Yates, Birmingham. An improvement of improvements in spades, shovels, forks, and other similar articles.

articles.

Dated February 17, 1869.

480 T. Sagar and T. Richmond, Burnley. Certain improvements in looms for weaving.

481 J. B. and B. Wood, Sowerby Bridge, Yorkshire. Improvements in, or applicable to, steam engines.

482 E. T. Hughes, Chancery-lane. Improvements in washing machines.

483 J. Atkins, Birmingham. Improvements in the manufacture of metallic bedsteads and other articles of metallic furniture.

484 E. Bound, Sheffield. Improvements in vessels for holding and cooling or warming fluids or solids.

manufacture of metallic bedsteads and other articles of metallic furniture.

484 E. Round, Sheffield. Improvements in vessels for holding and cooling or warming fluids or solids.

485 W. E. Newton, Chancery-lane. Improvements in adhesive stamps applicable for postal, internal revenue, and other purposes or uses, a portion of which improvements in the construction of the permanent way of railways.

486 F. H. Collins, Kensington Gardens. Improvements in the construction of the permanent way of railways.

487 A. Ransome, King's-road, Chelsea. Improvements in wood-cutting machinery.

488 W. R. Lake, Southampton-buildings, Chancery-lane. An improved method of obtaining benzole and its homologous substances from coal gas.

489 H. D. Bowyer, Ripley, Woking, and J. L. Norton, Belle Sauvage-yard, City, Improvements in the manufacture of wheaten flour.

Dated February 18, 1869.

490 H. Aland, Richard-street, Roupell-street, Surrey, Improvements in compound rotary blowing fans for producing a compound blast of high density.

491 F. J. Knewstub, St. James-street, Westminster, Improvements in fittings to be employed in despatch, writing, and other cases, boxes, drawers, or receptacles, which fittings can also be made to be used separately.

492 J. Darlington, Moorgato-street Chambers, City, Improvements in mineral and rock-drilling apparatus.

493 A. Rartholomew, Queen's-place, Great Westernroad, Glasgow. Improvements in apparatus for regulating the opening of sliding windows.

494 A. Muuro, Arbreath, and W. B. Adamson, Glasgow. Improvements in tools and machinery employed for cutting stone, slate, marble, rock, and other substances.

495 A. Garrison, Birmingham. An improved pendant string bolder.

496 J. D. Nichol and J. Eckersley, Edinburgh, Improvements in apparatus for drying and pressing printed paper.

paper.
497 C. Brook and M. Thompson, Halifax, and L. Barker,
Balldon, Yorkshire. Improvements in looms for weaving.
498 R. Pyne, Wellington-street, Strand. Improvements
in the construction of steps for the doors of railway and

other carriages.

499 J. A. Wade and J. Cherry, Hornsea, Yorkshire,
An improved machine for pressing bricks, tiles, or other

articles.
500 T. H. Martin, Swansea. An improved method for tightening piston rings to the cylinders of steam or other

engines.
501 D. G. FitzGerald, Battersea. A new or improved mode of constructing electric telegraphs and voltaic

mode of combinations batteries.

502 J. Newton, Leeds. Improvements in machinery for spinning flax and other fibres.

503 W. Daines, Gravesend. Improvements in anchors.

504 F. W. Mallett, New Haven, Connecticut, U.S.A. An improved machine for making sewing needles.

505 M. Vary, Scarborough. Improvements in ornamenting surfaces.

505 M. Vary, Scarborough. Improvements in ornamenting surfaces.
506 F. Delbreil, Versailles, France. Improvements in apparatus for the removing and facilitating the utilization of excrementitious or other refuse matter which passes into sewers, or is deposited in cesspools, or elsewhere, in cities, towns, and other localities.
507 T. Forster and P. B. Cow, jun., Streatham, Surrey. Improvements in the manufacture of india-rubber suction and other pipes, and of hose, buckets, bags, and such like vessels, for conveying or holding water or other liquids.

Dated February 19, 1869.

and other pipes, and or nose, outcasts, or other liquids.

Vessels, for conveying or holding water or other liquids.

Dated February 19, 1869.

508 W. M. Cochrane, Surbiton. Improvements in vessels for containing water and other liquids, and in means for suspending and carrying the same.

509 T. Tunstill and J. Dodgeon, Burnley. Improvements in looms for weaving.

510 E. Dorsett, London-street, City. Improvements in means and apparatus for heating, smelting, and working metals, and in furnaces employed therein, which improvements and apparatus for heating and otherwise operating upon minerals and other substances.

511 A. Henry, Edinburgh. Improvements in breechloading firearms.

512 L. G. Moore, Erith. Improvements in the construction of feathering sails for windmills.

513 J. Loader, Finsbury. Improvements in steam generators.

tion of feathering sails for windmills.

513 J. Loader, Finsbury. Improvements in steam generators.

514 S. Myers, New Bond-street. Improvements in churns, also in apparatus for whipping or beating eggs and performing other similar operations.

515 T. Smith, Manchester. Improvements in the treatment of fiannel, carpets, druggets, trouserings, broad and other woollen cloths.

516 J. Davey. Wisboach, Cambridge. Improvements in the construction of motive-power engines.

517 A. M. Clark, Chancery-lane. Improved means for increasing the tractive power of road and other locomotive engines and carriages.

518 E. Hewett, St. Leonard's-on-Sea. Improvements in cowls for chimneys and shafts.

519 H. T. and T. Jennings, Sidney-street, City-road. Improvements in steam engines.

520 J. Barton, Church-street, Birkenhead. An improved water heater.

521 W. R. Lake, Southampton-buildings, Chancerylane. An improved mode of, and means for, making and preserving ice, for cooling liquids, and for preserving the same and other substances.

522 M. M'Lennan, Liverpool. An improved permanent way.

Dated February 20, 1869.

way.

Dated February 20, 1869.

523 G. G. Hairs, Little Distaff-lane, City. Improvements in burning and vaporizing combustible liquids to obtain light and heat, and in apparatus employed therein.

524 G. Green, Aberystwith. Improvements in buddles for separating ores and other materials.

525 J. D. Gauldie and T. A. Marshall, Glasgow. Improvements in steam engines and boilers.

526 J. T. Wibberley, Leicester. Improvements in machinery or apparatus for winding cotton, silk, wool, or other threads, on spools or reols.

527 J. Mabson, Norwood. Improvements in appliances

627 J. Mabson, Norwood. Improvements in appliances for drawing corks, and for receiving the wax and dirt which fall therefrom. 528

A. Jacob, Bromley. Improvements in the ventila-

tion of sewers, 529 J. Eberhard, Tolmer-square, Hampstead-road. Im-provements in apparatus for propelling ships and other

530 H. W. Whitehead, Holbeck. Improvements in machinery for combing wool, cotton, flax, and other fibrous

machinery for combing woot, cotton, mas, substances.

531 M. Gray, Highbury Hill. An improvement in the manufacture of covered electrical conductors.

532 J. H. Morl, Cambridge. Improvements in har-cutting machines, also applicable to clipping or shearing sheep and other animals.

533 T. H. Simmonda, Great Mitchell-street, St. Luke's, and E. B. Moreland, Bartholomew-close, City. An improved compound for glazing or finishing linen-faced paper used in the manufacture of collars and cuffs, and for other purposes.

paper used in the manufacture of collars and cuffs, and for other purposes.

534 B. F. West, Southampton-buildings, Chancery-lane. An improved double-jointed butt-hinge.

535 F. G. Fleury, Merrick-square, Southwark. Improvements in meters or apparatus for measuring water and other liquids.

536 J. Daglish, Dene House, Seaham Harbour, Durham. Improvements in the ventilation of mines.

537 R. Forster, Buxton. Improvements in the construction of boilers.

538 J. E. Lucas, Allhallows Chambers, Lombard street.

Lucas, Allhallows Chambers, Lombard-street

538 J. E. Lucas, Allhallows Chambers, Lombard-street, City. An improved floating velocipede.

Date February 22, 1869.
539 J. and W. Weems, Johnstone, Renfrewshire. Improvements in machinery, apparatus, or means for malting, heating, drying, cooling, and ventilating, 540 W. Ibotson, New Inn, Strand, W. W. Ladelle, Wrayshury, Bucks, and A. G. Southby, Bulford House, near Amesbury, Wilts. An improved method of, and apparatus for, preparing esparto, straw, rags, or other materials for the manufacture of paper.
541 S. Osborn, Sheffield. Improvements in knives and knife bars for reaping and mowing machines.
542 J. O. C. Phillips, Birmingham. An improvement or improvements in the construction of sets or partial sets of artificial teeth.

improvements in the construction of sets or partial sets of artificial teeth.

543 J. W. Reid, Great Western-terrace, Bayswater. An improved mode of, and means for, preducing paper pulp or half stuff from wood and other fibrous materials.

544 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in heating apparatus for locomotive enzines.

engines.
545 G. A. Fall, Hoboken, New Jersey, U.S.A. Improvements in propelling vessels.
646 T. S. Blair, Tavistock Hotel, Covent-garden, Improvements in the manufacture of iron and steel.
547 J. and T. Leach and J. Goodyear, Rochdale, Improvements in machinery or apparatus for winding slivers or laps of wool, flax, cotton, or other fibrous materials.
548 B. J. B. Mills, Southampton-buildings, Middlesex, Improvements in the manufacture of artificial stone.
549 J. E. Liller, Bedford. Improvements in apparatus for printing.

for printing.

550 J. H. Johnson, Lincoln's Inn-fields. Improvements

in velocipedes.
551 W. E. Newton, Chancery-lane. Improvements in acrew wrenches. screw wrenches. 52 J. B. Rushbrook, St. Andrew's street, North, Bury Edmunds. An improved hurdle for folds for lambs

and sheep.

553 R. Meldrum, Pittormie, Cupar. Improvements in machinery or appuratus for stopping locomotive and other engines and vehicles or machinery when connected therewith.

554 J. Blyde, Sheffield. Improvements in scissors, or apparatus especially suitable for gathering flowers.

555 H. F. Freutel, Kingsland-road, Middlesex. Improvements in the manufacture of hats and caps, and other coverings for the head.

556 R. P. Williams, Great George-street, Westminster. Improvements in railway crossings and switches.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," February 23, 1869.

### LIST OF SEALED PATENTS. Sealed February 19, 1869.

2702 T. G. F. Dolby.

Sealed Febru	ary 23, 1869.
332 G. S. Dracopulo 34 J. Jeavons and C. Martin 363 R. Scholefield 357 J. Hanson 364 B. Burrows 365 N. J. Holmes 367 W. Strang 773 C. H. Gardner 89 H. Walker	ary 23, 1869.  2718 F. Preston and B. C. Hoss 2721 A. M. Clark 2749 W. H. Crispin 2831 M. Busson 2903 J. H. Johnson 3181 W. T. Rickard and W. C. Paul 3720 A. Krupp 16 J. G. Tongue
67 W. Strang 73 C. H. Gardner	W. C. Paul 3720 A. Krupp

26

### PATENTS ON WHICH THE STAMP DUTY OF £50

HAS B	LEN PAID.
478 J. Young 498 E. J. C. Welch 513 J. Kidd 520 T. Kennedy	521 A. Moore 639 H. S. Swift 574 T. Bulley 592 W. Clark
020 1. Rennedy	1 592 W. CIAPE

#### PATENTS ON WHICH THE STAMP DUTY OF £100

ALLE DES	D. 1 111D.
425 J. Combe 448 J. Wilcox 459 J. Spence 492 T. N. Kirkham and V. F. Ensom	482 R. Forster 506 T. Watson and R. Dracup 1248 J. E. A. Gwynne

# PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the following numbers:—

3158	340	356	370	386	396	412	424
3282	342	358	374	388	404	414	426
292	346	360	376	390	406	416	428
310	348	362	378	392	408	420	430
317	350	364	382	394	410	422	432
332	354	366	384	1			1

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list

ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

#### LIST OF SPECIFICATIONS PUBLISHED, For the week ending February 20, 1869.

No.	Pr.	No.	Pr.	No.	Pr.	Мo.	Pr.	No.	Pr.	No.	P	r.
	s. d.		s. d.		s. d		8. d.		8. d.		8. (	<u>-</u>
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065		2124		2172		2201		2225				4
71		2127		2176		2202		$\frac{2220}{2226}$		2249		•
93		2129		2177		2203		$\frac{2220}{2227}$		2250	0	•
96		2132		2179		2205				2251	0	4
97		2133		$\frac{2173}{2181}$		2206	-	2229		2254	0	4
199		$\frac{12135}{2135}$						2231		2255	0	4
100				2182		2207		2232		2256	0	4
		2139		2184		2208		2233		2258	0	4
101		2143		2185		2209		2234		2259	0	4
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		2152		2190	0 10	2212	1 4	2236	0 4	2270	Ô	8
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NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be sent, payable to ROBERTSON, BROOMAN, and Co. Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

## THOMAS TURTON AND SONS,

CAST STEEL for Cuttors, Punches, Taps, and s, Turning Tools, Chisels, &c

CAST STEEL Piston Rods, Crank Pins, Connecting Rods, Straight and Crank Axles, Shafts, and Forgings of

FILES, marked T. TURTON. Superior to any other make. (See results of trial in the "Times." July 26, 1851.)

TOOLS of all kinds for Engineers, Railways, Con-

EDGE TOOLS, marked WM. GREAVES and SONS. Electro-Boracic Steel, warranted to wear out three Tools made of Cast Steel.

DOUBLE SHEAR STEEL, SPRING STEEL, BLISTER STEEL, GERMAN STEEL.
SPRINGS, BUFFERS, and CAST STEEL TYRES
For Locomotive Engines, Railway Carriages, and Waggons.

SHEAF WORKS and SPRING WORKS,
SHEFFIELD.
London Warehouse: 35. QUEEN-STREET, CITY,
Where the Larger Stock of Steel, Piles, Tools, &c., &c., may be selected from.



#### **MECHANICS'** MAGAZINE.

LONDON: FRIDAY, MARCH 5, 1869.

#### EXPLOSIVE COMPOUNDS FOR PROJECTILE PURPOSES.

UNPOWDER, which has been in use for so many years, may now be considered as perfect as it can be made, as regards projectile force and uniformity of combustion. Recent attempts have been made to employ it in a more condensed form, by compressing the charges, but these have failed to a great extent. Of late years, several new explosive compounds have been manufactured as substitutes for gunpowder, and they have, for the most part, been described in our columns. It is claimed for them, generally, that they possess greater cleanliness, almost total absence of smoke, less sensible recoil for a given velocity of projectile, and reduction of danger in manufacture, as being less violently explosive in an unconfined state. These may be considered as the general claims to superiority of the new explosives. Being principally composed of vegetable fibres nitrogenized, they might aptly be termed explosive fibres. Those now in use are known as gun-cotton, wood-powder, and gun-felt. As a few years' experience only in the production of these compounds can be placed against as many centuries in the production of gunpowder, it is reasonable to expect further progress and improvement in these new substances. When gun-cotton was first discovered, its obvious advantages induced several governments to adopt it in the place of gunpowder. The nature of this substance, however, not being thoroughly understood, many serious accidents resulted from its use. The too rapid combustion injured arms in which it was employed, and it was further found to lack uniformity in firing; in fact, for the most part, gun-cotton was abandoned in disgust. Recently, however, many ingenious methods have been adopted to retard in discust. this great rapidity of combustion, and although gun-cotton can be and is used in shot guns with comparative safety, still it has not yet been produced with sufficient uniformity or slowness of combustion to shoot accurately in rifles. Until this be done, it cannot be considered as a perfect substitute for ordinary gunpowder. Gun-cotton, however, can now be produced in such a condition that it may be stored with safety and without fear of deterioration; and thus prepared, it is largely used for mining and engineering purposes.

Schultze's wood-powder is composed of minute cubes of hard wood, treated in a manner analogous to gun-cotton, and subsequently impregnated with other substances; it is used in a pure state, and requires compressing with considerable force, in order to obtain the best results. It can be fired in rifles, and this is a proof of a certain amount of uniformity, though it occupies a greater volume than gunpowder to give an equal initial velocity to the bullet. Reeves's gunfelt-another comparatively recent invention is composed of vegetable fibres, which are also treated analogously to gun-cotton, and subsequently impregnated with other mate-This compound is also used in a pure state, and can be fired in rifles. This material was invented and is now being manufactured by Messrs. Reeves and Co., of Glastonbury. It has been found to answer exceedingly well, both in sporting guns and in rifles, but, pending some practical trials which are to be made with this material in a

These two last-mentioned comformances. pounds are made of several different strengths. and the weight of charges used relatively to gunpowder is, of wood-powder, about onehalf, and gun-felt one-third, i.e., one is three times and the other double as strong as ordinary powder. These new explosives ignite at a much lower temperature than powder, but being composed of less solid matter, the combustion generates less heat, and as many rounds can be fired in a gun or rifle with as much safety as with gunpowder. The fouling is also considerably lessened; the ignition, although quick, does not impart the same sensible recoil. The more solid forms of fibre, such as wood-powder, give more recoil than gun-felt, from which it may be inferred that the elasticity of a compound to a certain extent checks in itself the sudden shock of ignition.

The reduction of recoil in military weapons is of some importance, as it limits the weight and velocity of the bullet. Action and reaction on the bullet and breech of gun may be the same, but when the gases are generated in a gradual manner, the sensible recoil must necessarily be reduced. Even with gunpowder this can be proved by experiment, as quick burning powder will give much greater recoil, with the same initial velocity imparted to the bullet, than a slow burning one. No doubt, the great portion of the motive power exerted by explosives is instantaneous in its action, and ought not to be generated before it is required to act on the projectile. A gas, doubtless, is elastic according to its density, and, if permanent in this respect (such as steam or compressed air), could not be generated too quickly to give velocity to a projectile. But with all explosives, the reverse has been shown to be desirable, i.e., provided a given charge will consume in a barrel before the bullet quits the muzzle of the arm. The slower the combustion the greater the velocity communicated to the bullet, the friction in the barrel being greatly reduced. Last year, a public trial took place with a view of testing the new explosive substances. Some very fair shooting was made with wood-powder and gun-felt at 100 yards' range in rifles, the latter equalling gunpowder in accuracy, and the former within 30 per cent. of it. If there is to be any competition this year, it is to be hoped that it will be at long ranges, that being the true test with rifles, reference being made to the angle of elevation and absolute deviation. As already intimated, some further comparative experiments are to be made with Schultze's wood-powder and Reeves's gun-felt, to which we look forward with interest, and the results of which we shall place before our readers.

#### THE LATEST PHASE OF THE ARMOUR-PLATE QUESTION.

T is not many months since we noticed the giant strides made at the Atlas Steel Works, Sheffield, of which establishment Sir John Brown is the head, in the development of the armour-plate question. Upon that occasion we described the rolling of the Upon that largest armour plate ever produced. Produced, too, not merely nor only as a specimen plate of the once-in-a-way type, but as a sample of practical work, which could be repeated day by day for any length of time, so long as orders were on hand for such plates. This plate, we may add, measured 20ft. long by 4ft. wide and 15in. thick, its weight being about 21 tons. But, besides the question of length in these plates, there was one of breadth, which was of great importance, inasmuch as by increasing the breadth of the plates, the joints, which were so many lines of weakness, were reduced in number, and the structure thereby greatly strengthened. It was in view of this circumstance that the short time, we defer a further reference either to its composition or its special per-

prominent the important point of whether the entire face of the shield or casemate could be constructed of one entire plate; in fact, with an unbroken front. The most eminent witnesses hesitated to affirm that this could be effected; and, at the time, the principal practical man at the Atlas Works denied the practicability of producing a perfect plate 12ft. by 8ft. in superficial area, and some 5in. or 6in. in thickness. It was, however, a difficulty to overcome which promised to be greatly to the advantage of some one or other. Considerable attention was given to the subject by the Atlas firm, and, in time, the theoretical solution of the question was embodied in a patent taken out by Mr. J. D. Ellis, the managing director at the works. On the 19th of last month, its practical solution was embodied in a perfect armour plate 16ft. long, 8ft. 6in. wide, and 5in. thick.

The great barrier hitherto experienced in rolling such broad plates has been the insuperable difficulty of heating wide masses When the pile was of iron in the furnace. more than 6ft. in width, the waste and burning of the metal at the sides was excessive, and there were no means of controlling this detrimental action. Mr. Ellis, however, has overcome this difficulty by an ingenious method of manipulating the slab. His process is to make a narrow pile by rolling the iron first to a length equal to its future breadth, and then, by turning it half round, the length is made to become the breadth. The pile is rolled down and out in the direction of its previous breadth until the full length and proper thickness of the armour plate is attained. By this method of treating the pile, Mr. Ellis also obviates another difficulty which has hitherto been experienced in expelling the slag or cinder from the intermediate spaces between the slabs constituting the plate.

The production of a plate under the new process was regarded with considerable interest by Government, which was represented on the occasion to which we have referred by Colonel Inglis, R.E., Captain Harrison, R.A., Captain Alderson. R.A., Lieut. Ellis, R.A., and Lieut. English, R.E. The pile consisted of five slabs, each 7it. by 6ft., and 34in. thick, forming a mass of 60 cubic feet, and weighing 14 tons. This mass was gradually heated to a welding point during 16 hours. On the day in question, the furnace door was opened at 25 minutes past 12 o'clock; the mass was soon under the rolls, through which it was passed backwards and forwards four times. After this, it was turned half round, and again submitted to the action of the rolls, until, at 10 minutes to 1 o'clockjust five-and-twenty minutes from the commencement of the operation—the plate was turned out finished. The process of rolling this plate was personally superintended by Mr. Jevons, the iron manager of the works, and conducted with consummate skill and coolness of direction. The rolls used are new ones, made expressly for this class of work, by Messre. Claridge, North, and Co., of the Phœnix Foundry, near Bilston. They are grain or soft rolls of cast iron turned down to the required dimensions, namely 11ft. long in the barrel (18ft. over all), and 34in. in diameter; their weight is 19 tons each. We have already given the dimensions of the finished plate, and need only add that plates 8ft. in width and 20ft. in length could as easily be produced at the Atlas Works. This result redounds highly to the credit of a firm which has always stood first in the production of armour plates, and has ever kept pace with the requirements of these advanced times.

Before concluding, it may not be inappropriate to notice the first instance of armour intended for the plating of the ship of a foreign Power, being tested by the British Admiralty officers. This circumstance occurred on board the target ship "Thunderer," at Portsmouth, on Thursday week. The trial was made with a plate selected from a number manufactured by John Brown and

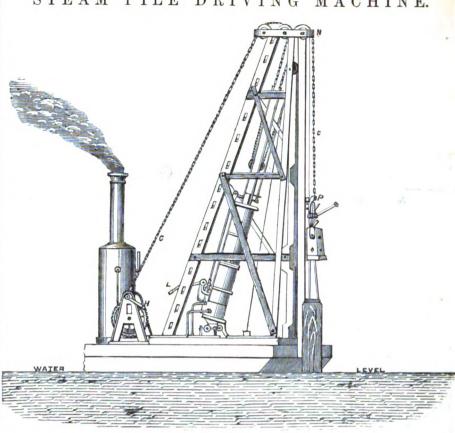
Co. for the Imperial Austrian screw ironclad frigate "Lissa." The dimensions of the plate were 12ft. 6in. in length by 3ft. 6in. in breadth, and 6in. in thickness. The plate was bolted on the backing on board the target ship in the usual manner, and fired at with spherical shot and 13lb. powder charges at the fixed distance of 30ft.; in fact, the conditions of the trial were precisely similar to those observed on the trials of plates for Her Majesty's ships. The five shot indents pro-duced on the diagram had depths respectively of 1·8in., 2·15in., 1·86in., 1·22in., and 2·09in. The cracks in the iron across the indents were exceedingly minute, and the maximum depth was only 7-8ths of an inch. On the back of the plate, the greatest extent of the bulge was 2 in. In its area, its longest diameter was 2.5in., and its shortest 2.4in. greatest depth of crack-longitudinal onlywas 1.5in., and width §in. Upon an examina-tion of the plate after it was taken down from the bulkhead backing, the excellence of the manufacture and also of the iron with which the plate had been built up were still more clearly proved than had been shown by the outer surface of the plate; a result upon which we further congratulate the Atlas Works.

### NOTES ON OUR NAVY.

IN a previous notice, I commented on the I impropriety of introducing the twin screw system in our war ships, before its advantages and disadvantages had been well gauged by experiments of a sufficient scale. At that time, I based my convictions on theory only, as I had never sailed in a vessel fitted with twin screws. Recently, however, I have had the most favourable and continued opportunities of conducting the necessary trials. I find that my apprehensions are more than realized, and the sooner such structures are discontinued the better will it be for the reputation of the Admiralty and the welfare of the country; for both will be seriously compromised if the building of such ships be persisted in. As I have already pointed out these many disadvantages, a repetition here will not be required. There is one important defect which I then omitted, and which is worthy of the most serious consideration of the advocates of the twin screw, as it assails them on the most important of their claims to superiority. I allude to the hopelessly defective steerage in a seaway, when running dead before the wind, and, worse still, when abeam. At first, I attributed a part of this to the helmsman, but repeated trials convinced me that the whole was due to the unequal velocities of the screws, as they worked in the air or water. The racing on the former taking place, was something marvellous, as no governors were fitted to the engines. When the starboard screw was deeply immersed, the ship's head fell off to port before the helm had the slightest effect; and ere it could be brought to its normal position, a roll in the opposite direction upset all previous calcula-

It is with regret I assert that we have sadly retrograded in the construction of small craft since Mr. Reed has been in power. In lieu of the safe, dashing, handy corvette of 1856, we have low unsafe rolling boxes of machinery. I have frequently counted their rolls when at anchor, in an ordinary trade swell, and have registered twenty-one in a minute. And such rolls! First the deck visible, and then far down the bilge. I believe the Admiralty are now thoroughly awake to their demerits, as two of the most unsafe have recently been sent to the penal settlement of Bermuda, to end their inglorious career amidst the coral reefs of that group, or to rot at their moorings off the dockyard. As one is constructed of iron, this leads us to that gigantic structure, the Bermuda dock, about which we have heard so much, and which is not yet across the Atlantic.

STEAM PILE DRIVING MACHINE.



appears to be a fatality about foreign floating docks, from which I trust this will be The one at Callao upset with a exempted. Peruvian frigate inside, and 250 men perished. That at St. Thomas sank in the hurricane of October, 1867, and still blocks the harbour up, in defiance of the skill of American divers. The reason assigned for sending out the The reason assigned for sending Bermuda dock is the porosity of the stone which forms the islands. Allowing that stone could not be cemented sufficiently close to keep the water out, is there any reason why a shell of iron should not have been riveted around the sides and bottom? Such a structure would have lasted our generation, and it is hard to say if the next will care about preserving Bermuda, for they will require a similar place on their own eastern seaboard, to keep a power in check whose ambition will sooner or later cause us trouble.

#### STEAM PILE DRIVER.

T would be suggested to anyone who had watched the process of driving piles by hand labour, that it was precisely one of those mechanical operations certain to be effected ultimately by the aid of steam. Anything more monotonous can hardly be imagined than the successive winding up of capstan or winch and the corresponding falls the monkey. In addition also to the monotonous character of the task, is the serious loss of time. This latter consideration has probably been the chief cause of steam being applied to substitute manual labour in pile driving, since time and money are now synonymous terms. Where the ordinary pile driving engine is employed, the operation consists in raising the monkey or ram to a certain height, and allowing it to fall freely upon the head of the pile. The The force of impact imparted to it, and by virtue of which it drives the pile, is evidently a compound of the weight of the ram and the distance or space through which it falls. But, besides the mere force of impact, which it is scarcely possible to determine with accuracy,

fulfilled in order to drive piles with despatch and economy, and the frequency of the repetitions of the blow must be had regard It might be imagined at first sight, that, provided the weight of the monkey, the fall, and the number of blows were constant, the results would be equally true for the same description of ground, and would be perfectly independent of the time occupied. In other words, that it would be of no con-sequence whether the blows were given quickly or slowly. This conclusion, although theoretically correct, is practically utterly fallacious. Experience has demonstrated fallacious. Experience has demonstrated that, cæteris paribus, the rate of descension of the pile is proportional to the number of blows given, and that in certain substrata blows given, and that in certain substrata the ratio is as high as the double. Let W represent the weight of the monkey, H the fall, and N and N  $^1$  the number of blows given in a fixed time. The descent of the pile will be proportional to W  $\times$  H  $\times$  N, and supposing W and H to be constant, then it will be proportional to  $\frac{N}{N_1}$ . That the frequent

repetition of blows is conducive to rapid pile driving can be readily demonstrated. If we imagine a pile to be forced a if we imagine a pile to be forced a little distance into the ground by a series of blows, and left in a state of rest for a short period, perhaps for a few minutes only, the ground which has been loosened all about it becomes close and tight again. It is, in fact, quite possible for the ground to reseattle in such a manner as to offer a to re-settle in such a manner as to offer a greater resistance to the entry of the pile than before it was disturbed at all. On the contrary, when the blows are given in quick succession, the earth has not the time to reclose around the pile, but becomes more and more loosened in its vicinity, until it is almost in the same position as it would be in a well, all that is necessary being to apply an amount of force sufficient to cause the pene-tration of the point. In soft sandy soils the rapid method is productive of very successful results.

It must be admitted that, hitherto, the usual calculations upon which are based the the, and there are other considerations affecting the principles of pile driving, take no notice of the ratio between the time and the number

of blows given in that time. The weight of the ram has always been regarded as the chief operating cause. This, to a certain extent, is a correct consideration, but its effect may be greatly exaggerated. A heavy ram in falling through a given height will produce a violent shock of impact upon a pile, but beyond certain limits the practical result accomplished is not proportional to the weight. With engines worked by hand it must be kept in view that the labour increases directly with the weight of the ram that has to be lifted. There is also considerable danger of damaging and bruising the head of the pile in instances, where, owing to either the weight of the ram or the great fall, the impact is rendered too violent. About twelve hundredweight may be taken as a limit that should not be surpassed without good reasons, and in many cases a somewhat lighter ram will prove more effectual as well as more economical. The fall is a variable quantity, being a minimum at the commencement of the operation, and a maximum at the termination, except where the piles are so long that splicing is necessary. The perfection of a pile driving engine would be one that would give the small blows with the same velocity and intensity as the larger, that is, which would never vary in impactive force throughout the whole opera-tion. A fall of 20ft. will be found the greatest that should be employed when the blows are given rapidly. A comparatively light ram, with blows in quick succession, has been proved to be more effective than a heavy monkey striking blows at long intervals.

The name of M. Chrétien is known to our readers as the inventor of a particular description of steam crane, which was exhibited at the Paris Exposition last year, and illustrated in our columns. That gentleman has now turned his attention to the invention of a steam pile driver, in which the principles already adopted by him in cranes and gantries are adhered to, so far as the different purposes for which the machine is intended will permit. It is represented in the accompanying engraving, and is of a simple and practical character. By its means, the intensity of the blows can be increased and reduced at pleasure, and the rapidity, when the fall is small, can be augmented to so many as one every second. This velocity depends altogether upon the steam power applied, and, like every other example of the application of that potent agent, is in exact proportion to the capacity of the boiler, or the amount of steam generated in a given time. The machine is set in action by the time. The machine is set in action by the lever L (see figure), every movement of which corresponds to a blow given to the pile, while, at the same time, the person in charge, by a turn of the winch handle H, causes the chain to unroll sufficiently to follow the ram in its descent after the pile, so that the ratio between the fall and the sinking of the pile is practically constant. This is one manner of using the machine, but it can also be employed to drive with a fall equal to the total height of the crosshead N, above the pile. In this case, the ram is drawn up to the top, disengages itself, and falls upon the pile, when it is seized by the hook P, and again ascends, to repeat the same operation. This ascends, to repeat the same operation. machine was recently employed, with great success, in driving the piles for the founda-tion of the syphon sewer laid under the Seine, near the Pont d'Alma, at Paris. In large works, where piling has to be adopted upon an extensive scale, there is no question of the superior economy of steam compared with hand labour; but unless there is plenty of work to be got through, and in a short period, the cost of these engines will always prove a drawback.

#### A VELOCIPEDE RAILWAY.

PNGLAND, France, and America are at to play against particular parts of the collopresent enjoying a quiet triangular dion surface, and to produce markings of game at velocipedes. In France, they have unequal action. The remedy is to have as

had races and matches; in America, they are doing—or trying to do—the thing on the tight rope. This is all very well for French excitement and American sensationalism, but it don't suit our English sober-going notions. So, we turn to the practical, and utilise this newly-revived system of locomotion for useful purposes. We propose velocipede railways—at least, one candidate for Bedlam amongst us does. Here is the sum and substance of a recent application to the Lord Chancellor for a patent which we found the other day in the Patent Office:—
One single line of rail is arranged in the middle of the roadway. The rolling stock is constructed with four bearing wheels, with double flanges, all in one line in the middle, underneath each carriage, instead of having bearing wheels placed on each side. Traversing screws and gear are employed for shifting the wheels laterally relatively to the body of the carriage, until the load is perfectly balanced upon the wheels. The perpendicular position is preserved by the addition of one or more wheels on each side of the carriage, so arranged, by working in slots, as to run freely upon the road, without bearing any part of the weight of the carriage, except when the carriage inclines to one side or the other.

Truly, the inventor expects and hopes to become a great man, but he must be a wise one first; and, if he is, he will consider the magnificent impossibility of his project before he expends another legal coin of the realm upon it.

#### IMPROVEMENTS IN PHOTOGRAPHY. No. III.

LREADY we have given notices of the chief features of interest in the year books of two of the photographic journals, so that only the almanack published by the proprietors of the "Illustrated Photographer" now demands attention. This annual contains one very valuable article by Major Russell, on the deterioration which so rapidly takes place in the working of the nitrate of silver bath solution, which is the most expensive of those used by photographers. More-over, the quality of the pictures gets worse as the nitrate bath loses its first purity and sensitiveness. It is well known that organic impurities in the nitrate bath cause fogging and other faults, and that these impurities may be removed: so this part of Russell's contribution need not now be considered. Another fault is caused by the liquid acquiring the power to form a colour-less crystallizable combination of nitrate of silver with iodide or bromide of silver, and it has long been thought that the evil is due to the complete saturation of the bath with iodide or bromide of silver. Major Russell brings forward experiments to show that this time-honoured idea is wrong, and to establish the following principle, which is a great addition to photographic knowledge:—
"The nitrate of silver can combine with a haloid salt of silver only when the power of the bath liquid to hold the former in solution is limited; or, in other words, when this liquid approaches to a certain degree the point of saturation with nitrate of silver. This effect is produced in practice by great strength of the nitrate solution, by the presence in it of alcohol and ether, which tend to precipitate the nitrate of silver, and of These nitrates other than that of silver. unfavourable conditions to good working assist each other; thus, the stronger the bath, the less alcohol in it will set up the crystallizing action." The bath, therefore, should never be made stronger than is necessary, and great care should be taken to keep it as free as possible from alcohol and ether. Another fault is often caused by the lower ledge of the glass dipper projecting too far, thereby causing ripples of nitrate of silver

small a ledge as possible, or use a dipper of silver wire, and to lower the plate gently, though without halting.

A good suggestion, likely to enable photo-

graphers to obtain natural clouds in landscape pictures, is made by Mr. Thomas Sutton, B.A. He recommends that the stop before the lens, instead of being placed vertically, as usual, shall be inclined at an angle of about 35deg. to the vertical, the upper part of the stop being then further from the lens than the lower part. If the pencils of light from the object be traced through a landscape lens furnished with such a stop, it will be seen that the amount of light from the sky, which would otherwise fall upon the plate, is much lowered. The suggestion appears to be very simple and valuable, but Mr. Sutton omits to state how he has found it to answer in practice. The almanack also contains a useful article, by Mr. J. C. Leake, with small cuts illustrating some of the art principles which should be borne in mind by landscape photographers. There is a contribution by Mr. George Dawson, M.A., who gives practical information upon the dry processes; and there are articles by Messrs. E. B. Fennessy, W. Willis, C. Russell, R. H. Courtenay, A. H. Wall, and T. Attwood. This almanack H. Wall, and T. Attwood. This almanack differs from its competitors in the fact that it is illustrated with many groups, and standing and sitting figures of ladies and gentlemen, so as to be useful to photographers who wish to place sitters and standers in graceful positions, other than the stereotyped attitude, wherein the person represented is seen nervously grasping the top of an uncomfortable-looking straight-backed chair. A table of temperatures in the beginning of the almanack tells the readers that milk freezes at 230deg. Fah., which of course implies that the editor melts his milk every morning for breakfast by the aid of a small blast furnace. The same table says that phosphorus melts at the zero of the Fahrenheit scale, that wine freezes at 120deg., and that water boils at 112deg. As a whole, the almanack of the "Illustrated Photographer" is worth having, and its graphotype illustrations are interesting, though they show that as yet this process cannot compete in quality with good engraving upon wood.

### ELECTRICITY AND TELEGRAPHY.

ON January 10 an interruption occurred on the Corfu and Otranto cable. The Telegraph Construction and Maintenance Company's steam ship "Chiltern" was specially despatched for the repairs, and communication was restored on the 25th nlt.

In consequence of the accident to the "Calcutta," the Persian Gulf expedition was necessarily delayed. It is now determined upon to postpone the submersion of the cable until the latter part of the year, after the cessation of the monsoon. The "Tweed" will probably leave about the end of May, and the "Calcutta" as soon after as the repairs rendered necessary will allow. The latter vessel, now at Plymouth, has been temporarily repaired by divers, and her cable being coiled on shore, so as to render her fit to be taken into dock, and to allow of the damage done by the collision to be repaired. This is a matter that will not take so long as was originally thought. The steamer "Caroline," belonging to Mr. Henley, has been chartered, and is now at Plymouth, and so soon as she is fitted up with the necessary machinery, she will proceed to pick up the seventy miles of cable paid out from the "Calcutta" after

The Mediterranean Extension Telegraph Company have issued a favourable half-yearly report. In consequence of the laying of the new direct line from Malta to Alexandria, and of the new proposed line from Sues to Bombay, it is in contemplation by them, as a just measure towards the public, and in their own interests, to lay a second cable from Malta to Sicily, at a cost of

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about £11,000. The length is but short, and in view of the greatly improved communication to India, on the completion of the British Indian line, it would be a most unwise policy to trust through communication to one cable only through this distance—a very short, but important, link in our great Indian chain of telegraphic communication. The existing cable has already lasted a long time, and in all probability will last an equal period, but the cost of an additional cable is small in comparison to the enormous advantage of the perfect certainty of a communication free from interruption.

The directors of the United Kingdom and the British and Irish Magnetic Telegraph Companies, as well as all the other companies, are now busily engaged in settling the actual money terms of the transfer of their properties to the Government.

The increase in the Magnetic Company's system during the past year has been 311 miles of wire and three stations, their total being at present 19,275 miles of wire and 513 stations.

The report of the United Kingdom Telegraph Company is as satisfactory as those of the other telegraph companies, and not only shows a large amount of business during the past year, but also good hopes for the future. An increase in their mileage has been caused by erecting new wires, in connection with the new Danish cable, submerged in September last, which gives two cables, to Russia. The one has already been laid to Bornholm; the other will be laid in the spring. As regards this route, "for the short period the Danish cable has been open, however, the directors are satisfied that the current year will prove the expenditure for the erection of the special wire in connection with this cable to have been one of a highly advantageous character to this company."

A cable is in course of construction to be laid from Scotland to Norway. This line will be in connection with this company. It is further contemplated to extend this line to Russia, so that there will then be a duplicate route to Scan-dinavia, Russia, China, and the East. To be ready for the submersion of this new Norwegian cable, which is now in course of manufacture at the works of Mr. W. T. Henley, at North Wool-wich, the company are erecting a special wire.

The manufacture of the French Atlantic cable continues in the most satisfactory manner. main cable from Brest, with its shore ends, and the shallow water cable, with its shore ends, for the United States section, are all gradually proceeding towards their completion. Up to the present ing towards their completion. Up to the present time, about 1,700 miles of the main cable and 450 of the shallow water have been completed. The coiling on board the "Great Eastern" is going on, there being already about 900 miles in the big ship.

The tests of the conductor and insulator prove that the contractors are supplying cable much superior to the specified contract.

The Telegraph Construction and Maintenance Company have issued their report, and held their meeting, when a dividend at the rate of 10 per cent. on the year was declared. The present position of the company is as satisfactory as the shareholders could wish, and during the past year they have executed a large amount of submarine telegraph work, giving a total of 1,971 miles of cable made. The principal works executed are the manufacture and laying of the direct Malta and Alexandria cable, the Tasmanian cable, portions of the French Atlantic cable, and other minor con-tracts. The contract for the Malta and Alexandria line included the purchase of the company's direct overland line from Susa in Italy to Modica in Sicily. and the transference of the old Malta and Alexandria Government line. They report that the new Alexandria line "has been working in a most satisfactory manner, and, like all other cables submerged by this company, far exceeds the specified insulation and transmitting speed."
Under their auspices, and those of the great ship

company, and some capitalists, the British Indian Submarine Company, with a line from Suez to Bombay, thas been brought successfully before the public. The contract is obtained by them, but the profit is a deferred one, which, in the estimation of the directors, is a certain one. They feel that in bringing British India and Great Britain into telegraphic relation is really opening

3,600 miles of cable. The contract with the French Atlantic Company is proceeding in a most satisfactory manner, and as the distance over which the cable extends in the deep sea route from Brest to St. Pierre is nearly identical with that in which the Atlantic cable of 1865-1866 were successfully submerged, the risk, therefore, they consider, is not increased, although the total length of cable is nearly double that of the Atlantic cable. During the past year, their ship, the "Hawk," successfully, and with expedition, repaired the break in the 1866 Atlantic cable—a proof of the certainty and despatch with which this company can repair cables made and laid by them; a fact, also, which will further tend to increase public confidence in submarine telegraph property. They further report that "care has been taken to keep the company's works, at Wharf-road and at East Greenwich, in a perfect state of repair, and improvements have been introduced greatly increasing our power of production." Enough has been shown to prove the satisfactory nature of the company's operations during the past year, and that there is every prospect of the present year being more favourable to the interests of the shareholders, it is sufficient for us to notice the fact that already the company have on hand orders to the extent of 6,408 nautical miles of cable.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

PRODUCTION OF ROSANILINE WITHOUT ARSENIC ACID -SULPHUR IN GAS FLAMES-A FIREMAN'S PLAT-FORM.

N interesting report to the Société Industriel of Mulhouse, by M. Schutzenberger, gives an account of the manufacture, by M. Coupier, of the red aniline dyes without the employment of arsenic acid. By abolishing the use of this reagent the production of these colours becomes of less cost, and the inconveniences which result from the accumulation of a poisonous residue are avoided. The colour produced is a salt of rosaniline, just as our magentais, but it is conceded that the tint is not quite so bright and pure as that made by employing arsenic acid. The yield of dye, however, is somewhat larger, and the process, as we have said, is cheaper. M. Coupier heats together a mixture of pure aniline, nitro-toluene, hydrochloric acid, and iron filings, this last being employed in but small quantities. A mixture of commercial aniline and nitro-benzol with the same acid and iron will serve just as well, and the colour produced will be the same in each case. We gather from the report, though it is not expressly stated, that about equal parts of aniline and nitro-benzol may be used. The mixture is gradually heated up to 200deg. Centigrade, and the course of the operation is watched by taking a sample of the product occasionally.
When the conversion is complete, the contents of the still are a semi-fluid mass, which, as it cools, assumes the well-known appearance of the solid aniline reds, and may be purified by the usual methods. There are two economic recommendations in this process. The expense of converting half the aniline is saved, and the cost as well as the dangers of arsenic acid are avoided.

A discovery has been made by M. Sallet, somewhat interesting, in these days, to gas examiners and makers. If any solid body be pressed upon the nearly colourless flame of pure hydrogen gas, the flame is seen to be suddenly coloured blue. The cause of this has never before been explained by chemists, but M. Sallet tells us that it is caused by the vapour of sulphur in the gas. As the hydrogen is supposed to be pure, the question arises, whence comes the sulphur. According to our author, it comes from the reduction of sulphates always in suspension in the air, and more particularly from sulphate of sodium. Soda salts, we know, are everywhere present in the atmosphere.

An important auxiliary in extinguishing fires

has been invented in Providence, R. I. It is called the "fireman's platform," is mounted on one truck, and consists of three cylindrical sections which shut within each other like telescope slides, and can be elevated into a tower 50ft. high, wherewith to reach the upper stories of a burning building where the field to a very extensive series of operations in reach the upper stories of a burning building where cables to Australia and China, and will succeed in enhancing the value of all submarine telegraph property, both in the Mediterranean and in the Atlantic. The amount of this contract will be in flames. The sections are constructed of light

concentric rings of wrought iron, so that the whole apparatus weighs only 3,300 pounds. The walls are divided by rounds, which thus form ladders.

#### PARLIAMENTARY NOTES.

YESTERDAY week, in the House of Commons, Mr. CHILDERS brought up the navy estimates, and gave notice that he would on that day week move that the House should go into committee upon them. Mr. OTWAY brought up the army estimates, and Mr. CARDWELL subsequently gave notice that on Monday, March 8, he would move that the House should go into committee upon them.

On Friday, Mr. J. Howard asked the Attorney General whether it was the intention of the Government to introduce during the present session any measure for the amendment of the patent laws; and, if so, whether it was the intention of the Government to embody in the bill the "recommendations" of the Royal Commission (dated July 29, 1864) appointed to inquire into the working of the law relating to letters patent for inventions.

The ATTORNEY GENERAL said there were so many important questions to be dealt with that he was not able to hold out any confident expectation that the Government would be able to deal with that question in the course of the present session.

Viscount Engield asked the Secretary of State for War when the medal promised by the late Secretary of State for War on the 6th of last July to the naval and military forces engaged in the late campaigns in New Zealand was likely to be issued.

Mr. CARDWELL said that the army estimates which had been presented on the preceding day contained a proposal for a sum of money to be appropriated to that object, and the design for the medal would, he believed, be very shortly ready

for her Majesty's approval. Mr. Sykes, in moving for leave to bring in a bill for the preservation of sea birds, said the sea birds of England were gradually disappearing from our coasts, and the object of this bill was to protect them during the breeding season. brought the measure forward in the interests of three important classes of the community-the farmers, merchant sailors, and deep-sea fishermen. The sea birds were valuable to the farmers in destroying worms and grubs, valuable to the merchant sailors by giving warning with their shrill cries in foggy weather of the proximity of rock, and valuable to the deep-sea fishermen because they hovered over the shoals of fish, and so pointed out the places where the fishermen might cast their nets .- Leave was given for the introduction of the bill.

Sir J. HAY called attention to the rule of the road at sea, and was desirous to ask a question of the President of the Board of Trade on the sub-ject. The "rule of the road at sea" he observed was a technical term for certain regulations issued by the Board of Trade for showing vessels passing each other how they were to keep clear of each other, and avoid collision. The rules which had been drawn up on the subject were exceedingly useful. They had been translated into various rule of the road by nearly all maritime nations, and, without sufficient cause, it would not be desirable to meddle with them, but there were two relating to steamers passing each other, "end on," which he thought required alteration—he alluded to Articles 13 and 14 of these regulations. He thought it would be well that the simple rule should be, when two steamers were nearing each other, to starboard the helm to a ship on the starboard bow, and to port the helm to a ship on the port bow. It was very desirable that every precaution should be taken to prevent the risk of collision.

Admiral SEYMOUR concurred in the alteration suggested by Sir J. Hay. There was also another matter to which he wished to call attention. He thought that sufficient stress had not been laid on the question of stopping the engines. In the case of the collision between the Osprey and the



I should enter into the minute and technical points to which the attention of the House has been drawn. I think it will, perhaps, be better for me to read a little memorandum which I made this morning, and which will probably be a sufficient explanation. I understand that the present rule of the road at sea, as adopted by this country, was adopted after the very best professional assistance had been obtained, and after the fullest discussion had been obtained, and after the full statement of the full state secured. The Trinity House, the Board of Admiralty, the Board of Trade, and the judge of the Admiralty Court in England, communicated with the French government on the subject, and both were unanimous in their conclusions. This agreewere unanimous in their conclusions. ment was come to in 1862. Since then it has been considered by the authorities of every maritime state on the face of the earth, and it has been adopted by all of them. The rule of the road agreed to in 1862 is, therefore, at this moment the rule of the road for ships of all nations, and cannot be altered without the concurrence of mations. England cannot now of herself undertake the responsibility of altering this international law. But with respect to the particular point to which the hon. gentleman has called attention, as to the certain rule to be adopted by ships approaching each other "end on," this particular matter has been reconsidered since 1862, and a further explanatory order was issued in July, 1868, when I think the hon. baronet and the gallant admiral were members of the Board of Admiralty, but pro-bably they have forgotten what was done at that time. I understand that their own Board of Admiralty wrote to the Board of Trade and gave their entire assent to the explanatory clause which has been agreed upon, and I think, after that, I may fairly ask why, when they were at the Board of Admiralty they did not endeavour to attempt to remedy this imperfection. I may further state that the Board of Trade have received a large number of pamphlets and suggestions on various branches of this subject, and I believe no two of these pamphlets or suggestions agree. The rules now in force are very simple; and it is hardly possible that any man who is sober, and in his senses, and not panic-stricken, should not be able to learn and apply them. They are taught to all masters and mates of ships, and they cannot have their certificates until they thoroughly understand them.

On Monday Colonel SYKES asked the Secretary of State for War on what grounds he refused to permit the invention of Mr. Groundwater for the readaptation of used musket cartridge cases to be tested, so as to ascertain whether or no a considerable saving might not have been effected in the consumption of cartridges; and if it were not the fact that the machinery used by the Govern-ment was adapted only for the original construction of the cartridge case, and not for its readaptation for service.

Mr. CARDWELL replied that the Director General of Ordance was perfectly satisfied with the present machinery by which this object was attained.

On Tuesday Mr. HANBURY-TRACY asked the First Lord of the Admiralty if his attention had been called to the present condition of the Royal Naval Reserve, and if it was his intention to introduce any measure to increase its efficiency.

Mr. CHILDERS said his attention had not been called in any specific manner to the condition of the Reserve, but that he would state the course which the Admiralty proposed to adopt with regard to it when he moved the navy estimates.

At the same sitting Mr. W. Cowper asked the

First Commissioner of Works whether the large accumulations of refuse from brick-kilns that now covered the green slopes of Hyde Park, near the lower end of the Serpentine, had been placed there in the hope that they would imitate rock-work; or, if not, for what purpose they had been brought

Mr. LAYARD assured his right hon. friend that he had not the slighest intention of cheating him or any one else into the belief that the brickwork was intended for rockwork. What his right hon. friend, with a poetical license, called the green alopes of Hyde Park, formed merely the banks of a very dirty ditch through which fell the outcome of the Serpentine. The brickwork had been placed there simply because it would form a good foundation for the subsoil in which certain shrubs were to be planted.

On Tuesday evening Mr. Alderman Lusk asked the First Lord of the Admiralty whether his attention had been directed to the reports in the public journals of the large quantities of Australian

the favourable statement of his Royal Highness the Duke of Edinburgh in regard to the Australian Preserved meat published in the "Times" of November 2, 1868; and whether, seeing that the preserved meats produced at the Deptord Dock-(according to Parliamentary Return, No. 353, of last Session) cost 11d. per pound, he intended to continue to supply the navy with that manufactured by Government, or to buy in the open market.

Mr. CHILDERS said that so far back as 1865 the attention of the Government had been called to the possibility of obtaining meat for the use of the navy from the Australian colonies at a lower cost than in this country, and inquiry on the subject was made through the Australian Government, but did not end in any satisfactory arrangement. Last before the present Admiralty took office, a certain quantity was purchased and issued to different ships, in order that the epinion of the officers and crews might be taken on the matter. A reply had been received, which, for the most part, was entirely satisfactory, and the Admiralty had ordered notices to be issued for tenders. would have to state, in moving vote No. 2 in the Navy Estimates, the financial result of such an arrangement. This is an important question for our naval authorities, and one upon which we shall have a few practical observations in our

## LAUNCH OF THE "VOLAGE" AND THE "AUDACIOUS."

ON Saturday last, the first of several vessels of an entirely new closes an entirely new class was added to the effective strength of the English Navy by the launch of the "Volage" at the Thames Ironworks at Blackwall. The "Volage," which has several original features with her sister ship the "Active," which is to be launched from the same yard the nex spring tides, is designed by Mr. E. J. Reed, for the purpose of combining great speed with ability to carry a few powerful guns. She is a vessel of the Alabama class, and in the event of war would, like the Alabama, be employed for annoying the commerce of the enemy. As she is intended to remain a long time at sea, it was necessary that she should be coppered, but the well-known antagonism of copper and iron of course required that the metals should not be in contact. To the iron plating, therefore, is attached a wooden sheathing, 31in. in thickness, fastened with iron bolts screwed through the plates, and secured inside with nuts. The heads of the bolts are sunk in the wood, and covered with a dowel, and then the sheathing is iron is thus completely insulated, and, to avoid any chance of galvanic action, the sternposts and the rudder frame are of gun metal. Over all a second sheathing of wood is fixed, by metal screws, which stop short of the iron plate, and on this upper sheathing the copper is fastened. The dimensions of the ship are:—Length between perpendiculars, 270ft.; extreme breadth, 42ft.; depth in the hold, 15ft. 2in.; her burden is 2,321 59-94 tons, and she will be furnished with engines by Messrs. J. Penn and Son, of 600-horse power nominal, an engine power which is expected to drive her at the rate of 15 knots, a rate of speed higher than that of any war vessel afloat; but beside her steam power, she will have the advantage of a full rig, so that she will be able to economize her coal. Her armament will be six 61-ton guns on her upper deck, a 64-pounder on her poop, and another on her fore-

On the same day there was also launched from on the same cay shere was also manched from the building yard of Messrs. R. Napier and Sons, at Glasgow, the "Audacious," a twin-screw iron armour-clad frigate for the Royal Navy. The "Audacious" has also been built from the designs of Mr. Reed, and is of the following dimensions Length between perpendiculars, 280ft.; breadth, extreme, 54ft.; depth, moulded, 36ft.; burden in old measurement, 3,774 19-94ths. be fitted with twin-screw engines of 800-horse power collectively. The framing consists of a strong, but light, combination of longitudinal and transverse frames, with a double bottom, formed by working upon this framing an inner and an of plates, the whole being strongly riveted together and made thoroughly watertight. The usual transverse watertight bulkheads are likewise fitted throughout the vessel, these being provided with sluice valves and watertight doors, &c. The decks have a covering of steel plating, riveted to the beams beneath the usual planking,

against penetration of the decks by plunging shot The armament is intended to consist or shell. of ten 121-ton guns-six on the main and four on together with four 64-pounders ck. The guns will be protected by the upper deckon the upper deck. an armour-plated battery, occupying the central part of the ship, and so arranged, by projecting slightly beyond the vessel's upper works, as to afford ample space for conveniently working them, at the same time giving a clear range for firing, not only in broadside fashion, but also right ahead or right aft, if required. The armour-plating is so disposed as effectually to protect the most vulnerable parts of the vessel. A broad belt of 8-inch armour is wrought on in the vicinity of the water line (except at extremities, where it is gradually lightened), and other parts of the sides and the battery are covered with 6-inch armour, having a backing of East India teak, 10in. thick, supported by a double thickness of plating, 14in. collectively with girders and internal frames.

Mesers. Napier have also in hand, and will launch shortly, a sister ship to the "Audacious," to be named the "Invincible." They are also constructing the "Hotspur," a vessel on an entirely new principle as regards the British navy. Its chief novelty consists in a fixed tower or turret, strongly armour-plated, to protect the armament, which, is at present intended to consist of one large gun, to be trained from port to port of the turret by a revolving turn-table.

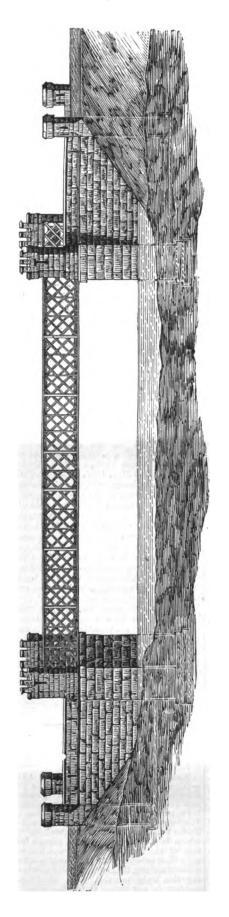
#### LIQUID FUEL

AT a recent meeting of the French Academy of Sciences, M. H. Sainte-Claire Deville continued the description of his researches on petroleum, undertaken at the Emperor's expense. experiments show that the heavier and more viscous mineral oils are the fitter they are for fuel. use in brick furnaces, he observes, is a problem already solved, the method consisting in letting out the oil from a reservoir through a stop-cock on a brick floor, placed behind a clay screen pierced with holes for the admission of the air intended for For this clay screen, M. Sainte-Claire combustion. Deville substitutes a thick cast-iron one. An apparatus of the kind described was placed on board the imperial yacht "Puebla," and was found to answer the purpose perfectly, being employed on a boiler producing steam enough for a 60-horse power engine. About May, 1868, M. Sainte-Claire Deville obtained permission to try his furnace on an engine on the Strasbourg Railway, where it was important to reduce as much as possible the bulk of the apparatus, and to suppress brickwork, since the constant shaking of the engine would be apt to get it out of order. Another difficulty was the quantity of oil, enormous in regard to the small surface at disposal, to be consumed in order to produce steam to the amount of 300-horse power. These difficulties were overcome by substituting cast iron for brick, and by artificially increasing the surface of evaporation, without enlarging the dimensions of the fireplace. Hence the apparatus intended for a locomotive simply consists in a fireplace so arranged as to present the largest possible surface to the action of The sole of the furnace may be of copper. heat. attached to the boiler, and inwardly kept moist The grating is provided with a series with water. of holes, through which the oil flows. This fuel gives no smoke, and does not emit sparks; the consumption of oil, at the rate of 60 kilometres per hour, was at the rate of 4.70 kilogrammes per kilometre.

WE understand that the visduct over the Holborn valley will be opened to the public in July or August

THE MANUFACTURE OF WATCHES AND CLOCKS THE MANUFACTURE OF WATCHER AND CLOCKS
—A most interesting and instructive little work
describing briefly, but with great clearness, the rise
and progress of watch and clock making, has just
been published by Mr. J. W. Benson, of 25, Old
Bond-street, 99, Westbourne-grove, and the City
Steam Factory, 58 and 60, Ludgate-hill. The book,
which is profusely illustrated gives a full descripwhich is profusely illustrated, gives a full descrip-tion of the various kinds of watches and clocks, with their prices, and no one should make a purchase with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, wholds the appointment to the Prince of Wales, sends holds the appointment to the Prince of Wales, public journals of the large quantities of Australian riveted to the beams beneath the usual planking, and other preserved meats that were offered for thereby imparting great longitudinal strength to age stamps, and we cannot too strongly recommend the vessel, besides affording the necessary security it to the notice of the intending purchaser.—| ADVI.

## BRIDGE OVER THE RIVER DULNAIN-HIGHLAND RAILWAY.





BRIDGE OVER THE RIVER DULNAIN—HIGHLAND RAILWAY.

WE recently illustrated one of the numerous bridges by which the Highland Railway is carried over the rivers and streams that intercept its course. We now give another example of these structures—that of a bridge of 80ft. span, crossing the river Dulnain, a mountain stream near Grantown. It is given as a specimen of a substantial bridge of this size. Length, 148ft.; height, 27ft. Cost per lineal foot, £22 5s. 6d. The cost was—masonry, £2,238; ironwork, £1,060;—total,£3,298. On the Central Railway of the Highland system, from Dunkeld to Forres, 104 miles, being a single line, there are 8 viaducts, 126 bridges over streams, and 119 public and accommodation road bridges. On the whole system there are only three timber bridges, which Mr. Mitchell, the engineer of the line, was forced to adopt chiefly with a view to save time, but these are very substantial of their kind. All the other bridges are constructed of stone, and where iron is adopted the piers are in general constructed of masonry. The iron bridges on all these lines were constructed by Messrs. Fairbairn and Sons, of Manchester, for about £20 per ton on the average, and are admirable specimens of workmanship in this department.

## ON A NEW ANEMOMETER.\* By Mr. Wn. Oxley.

THE anemometer which I am about to described has been constructed with the object of supplying at a low cost, an accurate, durable, and effective instrument for measuring the direction and force of the wind. So far as I know, there is no other anemometer that gives so many advantages at anything near the same moderate money value. The apparatus is composed of two parts—the one The apparatus is composed of two partsthe anemometer proper, the other a contrivance for receiving the papers, on which the registrations are recorded. As to the anemometer itself, it is a circular box 11in. diameter, and 21in. deep, which moves freely on its centre on a pivot at the top of a rod fixed firmly into a foot plate, so as to prevent oscillation. The box is horizontal, provided with a oscillation. The box is horizontal, provided with a space on one side, in which is placed a well tempered steel spring, which gives a range of 2\frac{3}{2} in. from zero, to what represents 40lb. pressure on the square foot. To this spring is attached a brass rod or rack, which works the pinion, on the axle of which are placed two fingers, one live and the other dead. These fingers move according to the pressure given (or movement of the pinion), and thus the force is shown by looking at the dist plate and the force is shown by looking at the dial plate, and the figure to which the live finger points shows the present force of the wind, whilst the dead finger is opposite the figure, showing the maximum pressure that the wind has attained during a given period. This is effected by a small pivot or pin at period. This is effected by a small pivot or pin at the point of the dead finger, projecting above the live one, so that as the live finger is forced by the live one, so that as the live finger is forced by the pressure it carries the other with it, and leaves it at that point if the wind decreases. In front of the spring in the space already referred to, is a small disc attached to a rod, on which is placed a wind plate of 6in. square. This plate is kept to the wind by a vane on the opposite side of the circular box, and as its area is just one-fourth of a square foot, the graduated dial figures being multiplied by four, gives the same result as though the plate were a gives the same result as though the plate were a foot square. This size of plate gives lightness, and foot square. This size of plate gives lightness, and reduces the friction to a minimum. The working parts of the instrument are protected from the weather by a glass lid or cover.

Having thus described the anemometer proper, which shows the force of the wind, I will describe how it makes self-records in a permanent form, and shows the range and direction of the wind at the same time. A pencil is attached to the movable rod holding the pressure plate, and moves backward and forward with the plate. The point of the pencil, which is vertical, rests on the paper, and whilst it has the lateral motion referred to it moves in a circular form, as the anemometer moves with the wind. The papers, which are 10in. in diameter, fit into a horizontal recess, placed belew the rod about 2in. under the anemometer. These papers can be changed daily, and measured by a prepared scale, and thus are permanent records of the force, range, and direction of the wind. If the maximum finger registered the force of a storm to be, say, 30lb. on the square foot, the pencilling on the paper would show, when applied to the scale, the blast came.

\* Manchester Literary and Philosophical Society.



ELECTRIC TELEGRAPHY IRRESPECTIVE OF TELEGRAPHIC APPARATUS.

By Mr. E. G. BARTHOLOMEW.

A T a meeting of the Society of Engineers, held A March 1, 1869, Mr. F. W. Bryant, President, in the chair, the following paper was read:—The extent of this interesting field is such that it is not attempted within the limits of a paper to enter fully into every point of detail which the subject embraces, and the author has, therefore, deemed it sufficient for the purpose to select such features as either in his estimation present difficulties to the less initiated, or contain within them grounds for discussion. He is aware that many nected with every subject, which, to those whose every-day life is more or less associated with it become matters of course, are nevertheless to many replete with that which requires explanabut as it is hoped such points will crop up tion. in the course of our discussion, he is content to confine himself for the present to what appears to him worthy of notice. It may be further that matters which possess interest, and nothing more, have been avoided; and, moreover, that as it would have been impossible to do justice to the subject of telegraphic instruments and apparatus upon the present occasion, any allusion to them in respect either of their construction or use has been omitted. The allusion to a galvanometer in connexion with inductive charge and discharge has been necessary for elucidation

The subject may be divided into the two branches which appear to be both obvious and necessary, since each branch contains facts totally distinctive and peculiar to itself; these branches are: telegraphy as applied to land lines, and telegraphy as applied to submarine lines. There is also a third division of the subject—subterranean telegraphy-which occupies, as it were, a middle position between these two, and which is better considered in connection with submerged

The development of land telegraphy had, until within the last four years, attained a decidedly higher stage than had submarine telegraphy. The experience gained in the one had been greater —the subject did not in itself present so many difficulties—and it did not involve a knowledge of certain physical facts which it was evident, even in its earlier days, the latter necessitated, and which became more obvious as the subject progressed. It is mechanical knowledge which assists us the most in the construction of a land line, whereas the manufacture and submergence of a telegraphic cable involves, besides that in a much higher degree, an acquaintance with many chemical facts, and a knowledge of the laws by which electricity is governed, to a much greater extent than is necessitated in the former case.

First, with respect to land lines: the conductor demands special attention. If a completed line of telegraph be compared to a "permanent way," the conductor or line wire represents the "metals." It is usual, or at least desirable, to proportion the weight of the rail per yard to the traffic expected and it is equally necessary that the conductor in a line of telegraph should be proportioned to the work it has to perform. It must not, however, be exactly proportioned, as will be seen from a further consideration of the subject. The duty of the conductor is to convey the electric current at all times when required, and under all circumstances which may arise, without opposing unnecessary resistance to its progress. A certain amount of resistance is unavoidable, but when this becomes excessive it will produce a variation in the carrying capacity of the wire under differing atmospheric conditions, besides causing uniformly indistinct signals, unless the undesirable alternative be adopted of increasing the battery power in order to compensate for, or overcome, the resistance.

The general question of Resistance (R) is one of serious moment, and of great interest in all electro-telegraphic matters, and although this remark more fully applies to submerged conductors, yet it must by no means be lost sight of

in open wires.

(R) is dependent upon three conditions: the length of the conductor, its sectional area or diameter if round, and the material it consists of. All substances are conductors of electricity to a certain extent, and all substances resist its passage to a certain extent. The two characteristics are the converse of each other; those which conduct the best resist the least, and vice versa. But a worse conductor may be made equal to a better by increasing its sectional area, or its weight per ously wet, that any appreciable loss of current mile. Thus; the conductivity of pure copper is takes place. This is supposing the insulators were

about eight times that of iron, but an iron wire of 3-inch will equal in conductivity a copper wire of .1-inch, from which it appears that (R) is in direct proportion to the area of the cross section. Again, (R) being in inverse proportion to the length of the conductor, a line of one mile of iron wire will equal in (R) a line of eight miles of copper wire, their diameters being the same.

There are several reasons why, in suspended lines of telegraphy, galvanised iron wire has become the universally adopted material for the conductor. It is less expensive than copper-it will bear a higher strain without breaking-and it is not subject to rapid deterioration. are two tests which the wire should undergo before being suspended—that is, if it is a solid and not a stranded wire which is to be employed; a short sample from each delivery should be held firmly by one extremity, and a narrow streak of some black pigment should be drawn ink down it upon one side from end to end in a straight line. The free end being then atto a cross handle, the wire should tached twisted in the same direction until it breaks; the number of twists per foot can then be counted by the black spiral formed. A good No. 8 wire will stand from 20 to 40 twists per foot. But the most necessary test to which a wire can be subjected is that of longitudinal strain. This must not be confined to short lengths. The quality of the iron may be good, but from want of care in making the welds there may be faulty places, and if the sample subjected to this test happens not to contain a weld, it may pass muster. The straining of a sample will prove the quality, but in the erection of a telegraph this is not sufficient. In this case, the whole length of wire, after being drummed out, should be tested in sec tions of from a quarter of a mile upwards, according to circumstances. The strain should be applied until the wire ceases freely to elongate, long before which period all bad joints and faulty places will have given way, and having stood this strain, the wire will be found to have lost all its "spring," and to be more convenient for handling. In this state it is said to be "killed."

With respect to the gauge of the wire, it has been shown to depend upon the length of the circuit of which it forms part. No doubt, in view of the law of R, every different length of circuit might have a different sized conductor, but other considerations step in. Suppose a wire to be just sufficient in its capacity for its work when newly it is evident that directly it becomes reduced in size, owing to oxid sation, it becomes too small; more battery power must then be applied to overcome the increased R. Again, as every instrument inserted in a circuit adds very considerably to the R of the whole, it is obvious that the addition of a single instrument to a circuit already carefully calculated cannot fail to be detrimental. But, lastly, if a wire be only just detrimental. But, lastly, if a wire be only just large enough for its work in dry weather, cr when the line is well insulated, any circumstance which diminishes the insulation—that is, which the causes leaks for the escape of the current-will increase the tendency of the current to leave the line wire to a greater extent than if the capacity of the line were ample. This latter point needs some explanation. The fundamental principle which should govern the construction of every electric telegraph is, that the battery current shall be compelled to traverse the entire circuit without loss or unnecessary hindrance. Electricity is a swift agent, but even electricity will save itself unnecessary journeys when it can. If it detects en route a loophole, however minute, it will escape in a greater or less degree, the degree being proportionate to the facility for its escape. This is indeed a popular way of regarding R; the largest amount of electricity will travel by the route on which it meets with the least R. If, then, the conductor be of ample area, the facility it for the passage of the current along itself will be greater in proportion to any given fault or faults than if it be only just sufficient; and therefore the divergence of the current from the line will be

Glass, earthenware, porcelain, ebonite, are all exceedingly low conductors of electricity, but when their surfaces become moist the moisture Rain water is pure water, or nearly so, conducts. when first it falls, and in this state conducts \$377 millions of times less than iron; it is, therefore, only when the length of a line is such that several thousand insulators, or points of support occur throughout it, and when all these are simultane-

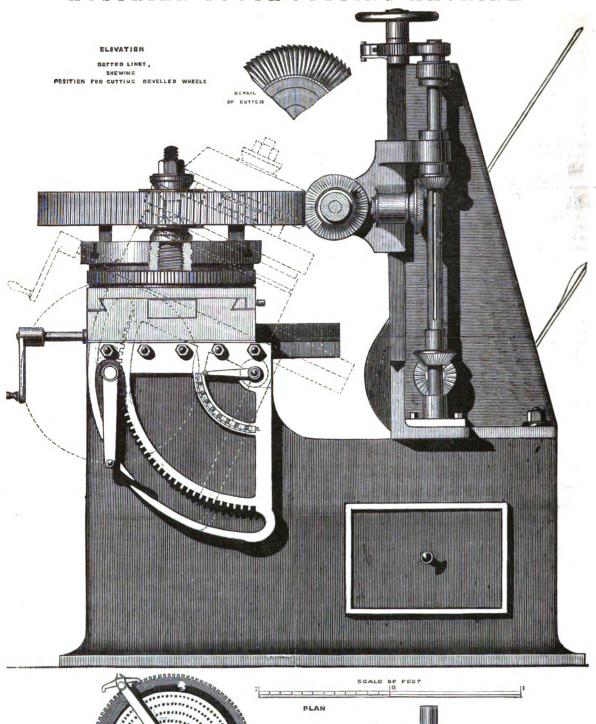
free from dust when wetted, for if dusty, or sooty, and then wetted, the loss is greatly more apparent. In the neighbourhood of large towns, and especially in the vicinity of certain manufactures, the loss is also far greater, owing to the salts with which the air is charged, and which the water absorbs. The importance of these well known facts cannot be over-estimated. If the R of the line, and the joint R of the faults be equal, then half the current is lost. The law of electric currents, in respect of diverging paths, is that the amount of loss is in inverse proportion to the R of the paths. Upon lines where several conductors are attached to the same supports, the dust and moisture which accumulates, not only upon the insulators but upon the surface of the wood between them, affords a path along wheh the electricity will creep, if possible, from one wire to others. it will readily do if the insulators are not kept clean, since two or more wires present less than one. This creeping to other wires should be prevented as much as possible, for it will produce upon them signals not intended for them, thereby causing confusion. "contact." It may be ent This is called "contact." It may be entirely removed by attaching a wire, called an "earth" wire, to each insulator support, and letting it pass down the pole into the earth, it acts by being a far less resisting medium than the damp surface of the wood. The wire may be with advantage extended upwards as well, and terminated in a point projecting above the pole; it will then act as a protection against lightning.

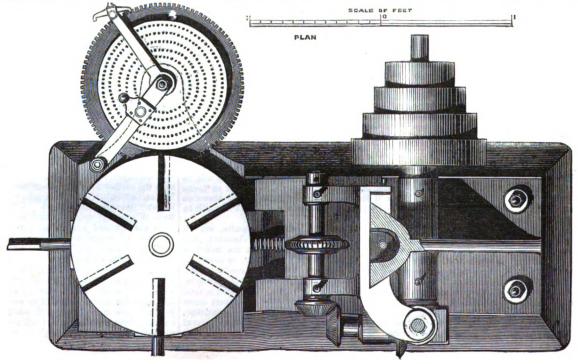
There must, however, be a limit to the size of the conductor, and between circuits of greatly differing lengths it is quite permissible to employ gauges of wire. No. 8 B. W. G. is different ample for a circuit of two hundred miles, but it unnecessarily large for one of two or three miles. A very considerable number of circuits do not exceed this length—for instance, those employed in train signalling—and for them a wire of No. 11 gauge is ample. Upon the other hand, for long through circuits of four or five hundred miles, it is desirable to increase the area of the conductor to about No. 4 gauge. In India, for local reasons, No. 1 is frequently employed. The greater cost of homogeneous iron wire renders it undesirable to be employed for ordinary lines of telegraph, neither is its superior strength necessary except for very extended spans. over-house telegraphs, where the spans are frequently from two to three hundred yards in length, and where the result of a breakage is serious, it is usual to employ a stranded iron wire. There are both advantages and disadvantages in the employment of a strand over a solid conductor. The strand is, perhaps slightly stronger, weight for weight, than the solid wire, 18 gauge wires weighing 7.32 lb. per 100 yards, breaking strain 600 lb.; a No. 13 solid wire weighing 7.05 lb., breaking strain 568 lb. larger surface exposed to the atmosphere is an objection in the strand, but its greater pliancy makes it safer to handle in passing it streets and over the roofs of houses. The size usually employed now is three strands of No. 18 Seven No. 20 gauge was formerly used, but the surface for oxidisation is too considerable.

With respect to insulators, their form should be such as-without greatly increasing their size shall present the longest straight line of resisting medium between their support and the wire resting upon them. The "invert," either single or double, meets this requirement. In addition to the prolonged surface of resisting medium, that part underneath the bell will be less su the be to the deposit of moisture than that which exposed. Here there will often be a zone or belt of dry surface when the remainder is wet. Of course this form is no protection against fog, which, it is well known, will find its way inside the neck of a bottle, but in rain the under side will be dry. The introduction of a metal cap over the earthenware was at one time presumed to be an advantage in lieu of the insulating invert because the heat which radiated invert because the heat which radiated from it quickly dried up the damp deposited upon the opposed surface of the earthenware; the loss of insulating surface was, however, a more serious disadvantage than any gain resulting from its adoption.

Every form of invert has, however, its dis-advantages, for since it is impossible entirely to exclude moisture, even from the under surface, and as, whilst moist, dust will be certain to settle, so whilst the first shower will wash all exposed surfaces clean, the under part will retain the dirt until cleaned by hand. The glaze upon the surface

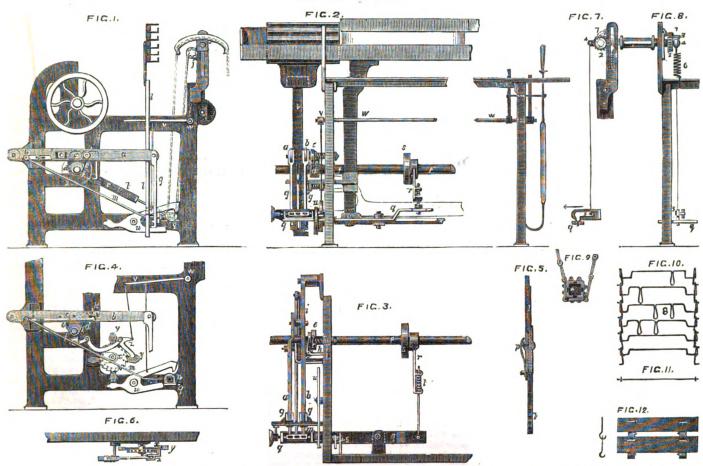
AUSTRIAN TOOTH-CUTTING MACHINE.





#### IMPROVEMENTS IN LOOMS.

BY MR. W. SHAW.



is of advantage, as it prevents the water forming a continuous film, allowing it to settle into un-connected drops. Glass is not a desirable material, because it more readily attracts moisture to its

surface than porcelain.

The chief causes of fracture in insulators are, stones thrown at them through mischief—an annoyance they are particularly subject to in the colliery districts—and the unequal expansion between the iron and the insulator in hot weather. To prevent the former, iron caps are frequently employed as a protection at an increased expense and with doubtful success. The latter being more general, is a more serious matter, and it becomes necessary greatly to increase the strength of the insulator in that part into which the iron is cemented, or to introduce a yielding material between the iron and the insulator, a plan adopted in 1855 by the author, who dispensed altogether with a permanent lute, and introduced vulcanised rubber tube. This plan has stood the test of fourteen years with perfect success. Ebonite has been largely employed as an insulator. In itself, ebonite—which may be considered as india-rubber deprived of a large proportion of its hydrogen by the action of sulphur at a certain temperature is probably the highest resisting medium in exist-ence; but exposure to the sun's light causes the surface to oxidise, and in this condition it becomes porous, and permits the superficial absorption of moisture.

The wooden supports upon which the wires are suspended form a very important item in a line of land telegraph. Originally all telegraph poles were of foreign timber, cut out of the solid balk. In appearance they were unquestionably superior to the rough larch poles so generally adopted now, but their cost was considerably higher, and their

durability not proportionate.

The extreme difference in the durability timber, placed in the ground, has attracted the attention of engineers for a lengthened period; but the telegraph engineer has to deal with the question so largely, and it forms so important an tem in his maintenance account, that the matter

has had very careful consideration at its hands.

The soil has doubtless much to do with the durability of timber, but the condition of the wood when set has much more to do with it. The buttend of an English larch pole of forty years' growth, felled during the winter, and having at least one years' seasoning upon it, will form a good and durable support. In selecting the poles it is best to choose those whose section shows the annulars to be close grown, with a fair proportion of "heart." Injections of creosote or sulphate of copper in solution may be advantageous, but if the sap be thoroughly expelled before the surface is painted or tarred, the timber will last very well. Constant attention is needed, however, to the ground line, a foot above and a foot below. At least every alternate summer the ground should be cleared out for a foot in depth round the pole, and the timber allowed to dry. When dry, a plentiful coat of gas-tar should be applied, and the soil filled in: the expense of this most necessary precaution will not exceed a few pence, whilst the advantage gained is very great.

It is necessary to test the interior of the timber occasionally by inserting a strong knife-blade, for it frequently happens that a fair exterior covers a mass of interior decay, the result of having allowed the sap to remain in the pores. Before the timber is placed in the ground it is advisable to char that part which will become the ground line, and to apply to it whilst hot—provided the sap has been entirely expelled—a mixture of one part of Stockholm tar, and four parts of gas-tar boiled with quicklime, to expel the water and ammonia.

The ordinary life of a telegraph pole may be taken as fourteen years, but the author has seen poles which have stood for twenty-four years in by no means the last stage of consumption, and he has seen others nearly decayed through, which have not been in the ground six years. He believes the cause of this remarkable difference is due solely to having disregarded in the latter case the principles just alluded to, either wholly or in

(To be continued.)

#### AUSTRIAN TOOTH-CUTTING MACHINE.

THE annexed engraving represents a very simple form of tooth-cutting machine of Austrian production, and which in the main resembles a well-known Leeds instrument for the same purpose. The mode of fixing the wheel on the double travelling

table, and pressing it by the hand-screw up to the revolving cutter, which descends through its cut automatically, is shown in the elevation, as well as the way in which the table can be tilted for beve work. On the plan is shown the method of advancing the wheel in which the teeth are being cut as each tooth is finished, by means of a wheel gearing into one on the spindle carrying the work, and provided with a brass dial with a number of concentric rings of studs. Each ring is differently spaced, and the lever arm carries a catch, which can be shifted to take on any of the rings, catching and moving forward by one or more pins as desired.

#### IMPROVEMENTS IN LOOMS.

MR. WRIGHT SHAW, of Clayton, Lancaster M has patented some improvements which relate to check looms, in which drop boxes are employed. These improvements consist, first, in the use of double-acting levers mounted on the loom frame, and reciprocating in opposite direcloom frame, and reciprocating in opposite direc-tions, which act in combination with a bowl mounted on a fixed stud on one of the levers, and which is caused to slide laterally, by a lever motion governed by the pattern chain, so as to bring the bowl in contact with one of two tappets of different diameters which actuate the same, thereby giving movement to the double-acting levers and bars suspended therefrom, which are provided at their lower extremities with notches or teeth. A second part of the invention consists in an improved construction and arrangement of the box rod, the upper part of which is attached to the boxes as usual, but the lower part is provided with a series of teeth or notches corresponding with the teeth or notches on the ends of the afore

said suspended bars.

A third part of the invention consists in an improved method of actuating the chain by the interposition of a spring between the lever carrying the barrel or cylinder and the tappet giving motion thereto. Another part of the improvements con-sists in an arrangement of apparatus for varying or retaining the number of picks from the same card, thus reducing considerably the number of links in the chain.

A fifth part of the invention relates to a novel arrangement of apparatus whereby pattern chains

varying in length may be actuated without causing any slackness, and consists in attaching to the taking-up barrel a ratchet wheel actuated by a attached to a lever having an adjustable weight. A sixth part consists in the use of shuttle boxes such as are used for plain weaving instead of the drop boxes when required. Seventhly and lastly, the invention relates to an improved form and construction of chain, and consists in the use of elastic wire or plate links of peculiar shape, which by slightly contracting or bending, they may be speedily coupled, their own elasticity retainthem in position and connection.

Such being the nature of Mr. Shaw's invention, we will now proceed to describe in detail the manner in which the same is carried into practical effect. In our engraving, fig. 1 is a side elevation of so much of a check loom as is necessary to illustrate the invention, and fig. 2 is a front view of the same; fig. 3 is a plan view of the improved apparatus. a b are the double-acting levers, to the latter of which is attached a stud carrying a bowl c capable of sliding laterally thereon, so that it may be brought into contact with either of the cams d e of different diameters fixed on the cam shaft f. The extremities of the levers a and b have bars g suspended therefrom, and provided with notches or teeth at their lower ends. h is the finger which moves the bowl in one direction when acted on by the sliding of the lever i which actuates the levers a and b, the bowl being returned to its original position when released by means of a spiral spring (as shown more clearly in fig. 4); & is the locking bar or pointer attached to the loom frame; Lis the drop box rod, the lower end of which is provided with a series of teeth corresponding with the teeth or notches on the lower extremities of the suspended bars q. When either of these suspended bars is brought into gear with the teeth or notches on the drop box rod, it imparts its rising or falling motion to the latter.

The suspended bars are brought alternately into contact with the drop box rod by means of needles m acted on by the pattern chain which passes round the cylinder n. o (see fig. 2) is the spring retaining bolt. The box rod l, as shown detached and partly in section at fig. 5, is constructed of two parts or bars which are capable of sliding one within the other, but are locked in their normal position by means of a V-shaped tooth p pressed upon by a spring so long as the drop boxes are working properly, but as soon as any unusual strain is caused, the spring and tooth give way and allow the bars to slide on each other, and thus breakage is prevented. The cylinder n is carried by a lever q connected by a root or link to a bowl working in a growy d cam or tappet con the shelf of working in a groov d cam or tappet s on the shaft f. This connecting rod or link r is made in two pieces, and is sufficiently rigid to actuate the cylinder, but is provided with a spring t which allows it to yield when required. The turning and stopping motion of the cylinder is effected by means of the horseshoe formed catch  $\nu$ , which is let fell and raised by means of a lever v on the catch rod w. The vibration of the lever q causes the upper limb of the horseshoe catch u to turn the pattern card cylinder n one-fourth a revolution at each movement, but should the loom be stopped at any time, either from the breaking of the weft thread or otherwise, the catch rod lever v raises the upper limb of the horseshoo catch u out of reach of the barrel pinion and places its lower limb in front of the lever q, and thus effectually stops the movement of the pattern cylinder.

#### COATING IRON AND STEEL WITH GOLD, SILVER, &c.

TN coating the baser metals with an adhering covering of silver, gold, or copper, the main difficulty is in purifying the surface of the metal to be coated; for unless the article to be coated is chemically clean no adhering coating can be deposited upon it. To overcome this difficulty is the object of a patent which has recently been taken out by Mr. J. B. Thompson, of Horton, near Slough. The purification, in the case of steel, iron, and cast iron, is effected by Mr. Thompson by means of nascent hydrogen in an alkaline solution. For obtaining this hydrogen in the nascent state, he uses a solution of hydrated oxide of sodium (of from 2lb. to 4lb. to the gallon of water). To this solution is added a small quantity of any of the compound cyanide salts which will not decompose readily under the action of a Daniell's battery of three cells; this will improve the solution, but it is not absolutely necessary. This solution is put into

a vat of iron to which the positive pole of a battery is attached. The articles being first made as clean as possible, they are passed in the vat and with the negative pole of the battery, the action of which must be such that a consider able current of hydrogen is evolved. Care should be taken to keep the solution up to the proper strength. The solution should be kept at a heat of from 120deg. to 150deg. Fah., and to prevent (what has been called) polarization of the articles by any excess of gas which may be evolved, which causes them to become black, and prevents their being thoroughly cleansed, the second part of the invention is necessary. When the articles have been in this vat from one to four hours, according to circumstances, they are transferred to the silvering, gilding, or coppering vat, and coated in the usual

The second part of Mr. Thompson's invention relates to the furnace and vat in which the cleansing solution is worked. The vat is an oblong iron vessel to which is connected a furnace and boiler The boiler is an upright one of the same height as the vat, and on the same level, made to hold two or three gallons, and connected with the vat near the bottom by means of a pipe of suitable bore, and also by another pipe near the top of the same bore. These pipes are of such a length that the vat is about 2ft. from the furnace. The action of the vat and boiler is this,—that when the solution is heated in the boiler it commences to circulate in the vat, a current flowing from the vat into the boiler at the bottom and from the boiler into the vat at the top as long as the heat is applied.

The third part of the invention relates to the burning in of the silver, gold, or copper into the iron or steel. This is performed by means of an apparatus of the following construction :- In the centre of a furnace is placed a melting pot of a size suitable to the work to be done. The bottom of this melting pot rests on the bottom of the furnace, and the fire is made round it so that the heat may be equal, or nearly so, in all its parts.
Within this melting pot is kept melted lead or an alloy of lead of a heat suitable for tempering steel. into which the articles are plunged and then quenched in water. The burning in of the silver may be performed by means of the flame of a blowother suitable flame, but the furnace is preferable for that purpose.

#### COMPENSATION FOR INVENTIONS.

WE have received the following memorandum from the War Office, which will doubtless interest most of our readers: to many it will prove of importance :- "In consequence of the numerous claims for compensation for loss of time, and for expenses incurred by private individuals in working out inventions of various kinds, as well as for rewards in consequence of such inventions, the Secretary of State considers it necessary to make known the following regulations:-

"1. Persons who desire to submit any invention for consideration should do so by letter addressed to the Under Secretary of State. The letter should describe the invention, and state whether the person who offers it for consideration desires to make any claim to remuneration in connection with it. In the absence of such a statement it will be assumed that no such remuneration is expected.

"2. Expenses incurred before the submission of an invention will not be considered to give a claim for repayment. No liability on behalf of the public will be recognized on account of loss of time or expenses incurred in connection with an invention after such submission, unless authority for such expenses has been previously given by letter signed by one of the Under Secretarios of State: and the liability will be strictly confined to the limits of expenditure authorized in such letter.

- "3. All claims for reward will be examined by council to be held at the War Office, and if any reward be recommended by the council and approved by the Secretary of State, the sum will, with the concurrence of the Treasury, be included in the Estimates, together with the report of the council: but it will not be regarded as due or be paid to the claimant until after the vote is passed by the House of Commons.
- "4. No claim for reward will be held to be established unless the invention has been adopted into the service, or substantial benefit to the public has resulted from it.

"War Office,
"February 23."

" NORTHBROOK.

RE-ROLLING OLD RAILWAY IRON

HE worn-out rails on the Erie and Pennsylvania Railways are re-rolled for further use in the same form, and this process is performed according to the following instructions, which are embodied in the specifications of that company:

1st. The old rails shall be piled in piles, and every piece shall be the whole length of the pile,

and the pile so made shall be rolled into flats.

2nd. All rails classed as 64lb, to 67lb, shall be olled from a 9in. rail pile, said pile to be made as follows .

3rd. The said flats shall be put into a pile of proper size for a rail, each flat being of the full length of the pile, and of which flats, the bar forming top or head of the rail shall be of a new, good, tough, granular re-worked iron, such as will weld well; to be 14in. thick.

4th. The lavers forming the central part or stem of the rail shall be of puddled or re-worked iron, of a good quality, or of old rails (at the option of the manufacturer), rolled to a thickness of not over in., and of such width that the various layers will break joints, and what is known as a staggered pile formed.

5th. The base of the pile, from which the bottom or flange of the rail is made, shall be of good re-worked fibrous iron—the under layer of which shall be of full width and length of pile, not less than  $1\frac{\pi}{8}$  in, thick. The pile shall be well and carefully heated, so as to insure a good weld.

6th. The short pieces furnished by the railway company, and all short pieces cut off by the rolling mill, shall be piled by themselves, and rolled into a flat, which flat shall either be piled in the rail pile or used in making flanges of the rail. The railway company shall have the right, from time to time, to direct in what part of said pile said flats so made of the pieces shall be placed: not more than two such flats shall be in any one pile.

7th. The rails to be rolled to pattern furnished by railway company; to be 25ft. long; not over ten per cent. shall be of shorter lengths, but not ess than 18ft.; all rails to be undercut kin.; to be notched 21in. from each end, the notch to be 1in. deep and fin. long, or of such dimensions as the

railway superintendent may direct.
8th. It is mutually agreed, that the railway company shall not exact from the iron works rails classed as re-rolled, to be of better material in the central parts and base of the pile than can be produced from the old iron furnished by said railway.

9th. Rails and process of manufacture shall be subject to inspection by such persons as the super-intendent of the railway shall select and appoint for that purpose.

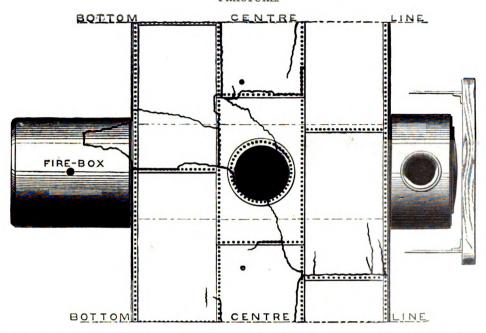
#### THE ROYAL NAVY IN 1869.

ON the 1st of February, 1869, the numerical strength of the British fleet-inclusive of ships atleat and building—was as follows:—Of armour-plated ships there were nine iron ships, third rates, afloat; seven of wood third rates, three of iron fourth rates, and seven building; two of wood fourth rates, affoat; one of iron fifth rate, two of wood sixth rates, and two sloops wood. The above are all screw steamers. There were two gunboats affoat double screw, one boat of iron, and one of iron and wood, and one ditto hydraulic. were two turret-ships afloat, iron, fourth rates, screw, and two building; there was one turretship of wood affoat, a fourth rate, with screw, and two others of iron, sixth rates, screw. One ram was building of iron, double screw. There were affoat three floating batteries of iron, screw, and and one of wood. This completes the lists of armour-plated vessels. Then there were fortyfour ships of the line, screw, afloat, and two building, but the building suspended. Thirty-two frigates, screw, were affoat: three ditto paddle: two block ships, screw; twenty-one corvettes, screw. and five building; thirty-six sloops, screw, were afloat, and two building; eight sloops, paddle, were afloat; ten small vessels, paddle; four despatch vessels, paddle; fifty-one gun vessels, screw and double screw, and three building; sixty-seven gunboats, screw, were afloat; ten tenders, tugs, &c., screw, and forty-one paddle; twelve troop and storeships, screw, and one ditto paddle; five transports for India reliefs, screw; four vachts, paddle, and one building. Thus there were 318 steam vessels afteat, and twenty-two building; and seventy-one paddle steam vessels affoat and one building; making a total of 389 steam vessels affeat and twenty-three building. There were besides the above, twenty other steam vessels, from which the machinery had been removed, affoat, making the total number of steam yessels 432.



### LOCOMOTIVE BOILER EXPLOSION.

PLAN, WITH THE PLATES IN THE CYLINDRICAL PORTION OF THE BOILER OPENED OUT FLAT, SHOWING THE LINES OF FRACTURE.



#### MANCHESTER BOILER ASSOCIATION.

THE last ordinary monthly meeting of the Executive Committee of this Association was held at the offices, 41, Corporation-street, Manchester, on Tuesday, January 26, 1869, William Fairbairn, Esq., C.E., F.R.S., LL.D., &c., President, in the chair, when Mr. L. E. Fletcher, chief engineer, presented his report, of which the following is an abstract:—During the past month 116 visits of inspection have been made, and 276 116 visits of inspection have been made, and 276 boilers examined, 142 externally, 7 internally, 3 in the flues, and 124 entirely, while, in addition, 5 have been tested by hydraulic pressure. In these boilers 98 defects have been discovered, 9 of them being dangerous. The following is a statement of defects, omissions, &c., met with in the boilers examined from January 1 to January 22, 1869, inclusive. Defects in boiler:—Furnaces out of inclusive. Defects in boiler:—Furnaces out of shape, 1 dangerous, 2 ordinary; fracture, 2 dangerous, 14 ordinary; blistered plates, 11 ordinary; corrosion, internal, 1 dangerous, 13 ordinary; corrosion, external, 2 dangerous, 18 ordinary; corrosion, external, 2 dangerous, 18 ordinary; grooving, internal, 2 dangerous, 15 ordinary; grooving, internal, 9 ordinary. Total, 6 dangerous, 67 ordinary. Defective fittings—Feed apparatus out of order, 1 ordinary; water gauges out of order, 6 ordinary; blow ont apparatus out of order, 3 ordinary; fusible plugs out of order, 7 ordinary; pressure gauges out of order, 4 ordinary. Total, 21 ordinary. Omissions—Boilers without glass water gauges, 3 dangerous; boilers without

pressure gauges, J ordinary. Total, 3 dangerous, 1 ordinary. Gross total, 9 dangerous, 89 ordinary. On the present occasion I have two explosions to report, by which four persons were killed and two others injured, while, as one of these occurred to the boiler of a locomotive engine, it may not be an inappropriate occasion to give the particulars of another explosion which occurred to a boiler of the same class a few months since, but which there has not hitherto been an opportunity of entering on. Not one of the explosions under consideration occurred to boilers enrolled with this Association. The following is a statement of explosions from January 1 to January 22, 1869, inclusive:—January 14, single-flue, or Cornish, internally

fired, 4 persons killed, 2 persons injured.

To deal fairly, therefore, with this catastrophe, and to learn from it all that it teaches, something else should be concluded than that it was due to "inattention on the part of the attendants." The boiler was allowed to work on by its proprietor with a dangerously disabled set of fittings, and thus it is thought he must at least share the responsibility of an explosion which scalded four men to death, and injured two others.

No. 2 explosion occurred at about two o'clock on the morning of Friday, January 22, to the boiler of a locomotive goods engine, by which the driver and fireman were severely shaken, though reported not to be much hurt, while fortunately beyond this, no case of personal injury resulted.

An officer of the Association was on the spot a few hours after the explosion occurred, but there has not yet been an opportunity of making a com-plete examination. This, however, it is fully expected, will be made in the course of a few days, so that the particulars may be reported to the members in due course; and in the meantime the details of the following explosion, which happened a few months since to a boiler of the same class, may not be uninteresting, since it is more than possible that they may give a clue to the cause of No. 2 explosion:—

The locomotive boiler explosion referred to occurred at about twenty minutes before seven o'clock on the morning of Tuesday, July 14, 1868, to the boiler of a locomotive engine employed in the goods traffic of one of our leading lines of railway. By it three persons were injured, but fortunately no one was killed. The engine had just left a station, at which it had stopped in the course of its journey, and entered an adjoining tunnel, with a train attached to it, consisting of a van and some fifty-seven waggons, when the explosion occurred, reducing the boiler to a wreck, severely scalding the engine driver, fireman, and leading guard, blowing down some platelayers at the other end of the tunnel, and shaking down some rockwork in a cemetery, under which the tunnel passed.

The engine was of the six-wheeled coupled class commonly employed for goods traffic, while the boiler was of the ordinary multitubular type, the barrel—which is the only part to which allusion need now be made—measuring 10ft. 9in. in length, 4ft. in diameter, and ½in. in thickness. There were three belts in the length of the barrel, each consisting of two plates, and so arranged that the longitudinal seams of rivets broke joint. The boiler was furnished with two open lever safety-valves, loaded to a pressure of 130lb. on the square inch by means of spring balances, fitted with suitable stop ferrules to prevent excessive pressure through the thumb screw being turned too far. It appears that the engine had been built in the year 1854 or 1855, while the tubes were taken out and the boiler thoroughly overhauled but three years before the explosion; in addition to which, slight repairs had been effected, and the engine turned out of the shop on June 30, 1868, after having been tested by hydraulic pressure up to 180lb. on the square inch, so that the boiler only ran about a fortnight after the last repairs before its explosion. When new it had been worked for some years with steam at a pressure of 140lb. per square inch, but latterly this had been reduced to 130lb.

The boiler rent in the barrel, nearly the whole of which was torn away from the fire box as well as the smoke box, and divided into three pieces, while the tubes were bulged out in a lateral direction both to the right and left, and the front tube plate torn away from the inner casing of the fire box. The

position and course of the rents, as well as the lay of the plates in the barrel of the boiler, will be better explained by the accompanying engraving than by any description.

On an examination being made of the frag-ments, it was found that the boiler had been attacked internally by corrosion, the bottom of the barrel being pitted from one end to the other and for a width of about 4ft., to a depth of onesixteenth of an inch generally, and one-eighth of an inch in some cases. Added to this, the plates were grooved at the bottom of the barrel at the an inch in some cases. edge of the overlap of the ring seams of rivets, one case to a depth of nearly 4in. Besides this, and which is of far more importance, there was a longitudinal furrow measuring 18in. or 20in. in length, and from three-sixteenths of an inch to a quarter of an inch in depth, at the edge of the overlap at a seam of rivets situated on the right hand side of the boiler, and in the belt of plates nearest the smoke box end. Where this furrow occurred, the plating was so arranged that the edge of the inner plate looked upwards and formed what is termed a shelf, which is generally thought objectionable on account of the facility it affords for the lodgement of corrosive impurities in the Through this longitudinal furrow the boiler rent, and there is little doubt that this rupture was the primary one from which the others sprung, and thus that the cause of the explosion was internal grooving or furrowing to which locomotive boilers are especially liable.

The subject of grooving or furrowing is a very important one with regard to locomotive boilers. It is, however, very simple, and too much mystery has been attached to it. This action takes place in stationary boilers as well as in locomotives, especially in those of the "Lancashire" type. The Association's inspectors are perfectly familiar with it, know at which part of the boilers to expect its effects, and regularly report upon them. It always takes place to a greater or less extent when an alternate hinging or buckling action occurs, combined with the use of a corrosive feed The parts of all boilers are in movement more or less from the local action of the fire and the internal pressure of the steam.

In the "Lancashire" boiler, grooving occurs in the majority of instances in the vicinity of the ends of the furnace tubes, in some cases attacking the end plates, in others the root of the angle iron, and in others the furnace tube itself. In these cases the grooving is at the crown of the tube, and assumes a transverse direction. The "Lancashire" boiler, if well made, is so abundantly strong in this direction that explosions do not occur to it from this cause, and little inconvenience is suffered beyond the occasional expense of repairs. There are but few boilers of the "Lancashire" type that are not affected more or less in this way, and were transverse grooving as dangerous as longitudinal,

explosions to this class of boiler would be much more frequent than they are.

In locomotive boilers the longitudinal grooves are caused by the constant changes of form which take place on the alternations of pressure, and thus induce the hinging or buckling action at the longitudinal seams of rivets already referred to, while it is possible in some cases that this may be promoted by the working of the engine. This distortion from internal pressure would not arise in the barrels of locomotive boilers if they were truly cylindrical; but the high pressure to which they are now worked has led to the adoption of thick plates, and it must be clear that the thicker the plate the greater the departure—with the ordinary overlap joint-from the true circle.

When making reference in the report for November, 1862, to an explosion of a locomotive boiler which occurred on the 8th of that month, and resulted, like the present one, from a longitudinal furrow at the edge of an overlap, I ventured to suggest the propriety of making the longitudinal joints with double butt strips, one being placed inside, and the other out, so that the true form of the circle might be maintained, the rivets placed in double shear, the line of strain always confined within the limits of the plates, and thus the parts maintained in equilibrio. Since then I have been informed by the locomotive superintendent of one of the main trunk lines of railway that he has adopted this plan, while he employs but one length of plate in the barrel of the boiler circumferentially, so that there is only one longitudinal joint in each belt, which he places above the tubes. so that it may not only be out of the water, and thus free from its corrosive action, but also in a part of the boiler more accessible to examination than when at the side or bottom of the barrel, as heretofore. This plan appears to be extremely simple, and all that is needed to prevent the occurrence of these longitudinal furrows from which so many locomotive boiler explosions arise, and therefore it was thought well to call attention to it on the present occasion, while it is trusted it will receive that general consideration which it appears to deserve.

ON XYLOGRAPHY, OR PRINTING AND GRAINING FROM THE NATURAL SURFACES OF WOOD.\*

BY MR. WILLIAM DEAN, SEN.

THE subject which it is my privilege to bring under the notice of your Society this evening. under the notice of your Society this evening, is a process for taking impressions from the grain of wood, and transferring those impressions on to other surfaces, and has been called "nature printing.

In showing my own patented process in different places, I have often heard it observed, "how very remarkable it is that this has never before been discovered," and indeed in that light I myself regard it, especially when I reflect on the fact that pieces of oak, such as I now hold in my hand, called by letter-press printers "reglet," have been in use by them for, I should say, at least a century, and probably for a much longer period, and that there never occurred to the thousands of masters and workmen, who, during that period, must have seen imprinted the veining of those reglets, the idea of turning the fact to practical account, and giving to it a commercial value. Yet such appears to be the case.

Before I enter on a detailed description of the process, I will glance at the range of the process and point out those branches of industry to which it is specially applicable. These are as follows:-For transferring impressions from wood to plain deal, or to painted surfaces, either flat or moulded. in buildings of all descriptions, where an accurate transcript of the more costly woods is desired, and for house and bedroom furniture generally; for japanned goods, made in metal or papier maché for enamelled parqueterie tiles, and for articles in earthenware, such as garden seats, oyster and flower tubs, spirit casks, flower-pots, tea-urn stands, &c.; for enamelled slate, for paperhangings, and for oil cloths.

Having thus briefly indicated the nature of the process, and the range of its application, I proceed to state the methods by which these results are Select a piece of wood of fine quality about 5ft. long, 12in. wide, and in thick; it is to use the technical phrase, cleaned up by the cabinet-maker on both sides, and is well sand papered down. By having both sides of the board

cleaned up, two patterns are tobtained from the same board. A chemical preparation is then applied to it, which has the effect of opening the pores of the wood, and, at the same time, of hardening the surface, and, when the board is thoroughly dry, it is ready for use, and is, in fact, a wood-plate, "not graven by art or man's device," but by the Great Designer and Architect of the Universe, whose works, the most stupendous as well as the most minute, are all perfect. The material used for taking the impression is prepared in oil, and is specially adapted for the purposes of transferring. The paper, too, is manufactured for the purpose, is very thin but tough so that it can be successfully applied to any irregular or moulded surfaces, and it is sized to prevent the colour from becoming incorporated with the body of the paper. A small wood roller is used for spreading the colour on the board, and a large, broad, flexible palette knife is used for taking the superfluous colour off. That being done, the sized paper is placed on the board, and both are passed through a small machine having turned-iron cylinders, the upper one being covered with double-milled flannel; the paper is then taken off the board, its printed surface is applied to the article to be decorated, the back of the impression is lightly rubbed with a piece of soft flannel, the paper is removed, and an exact fac-simile of the board from which the impression is taken is given. But that is not all, for a second and a third transfer are frequently obtained from the same piece of paper, and sometimes a fourth, a fifth, and a sixth. This is one of the remarkable features of the process, and, as you will not fail to perceive, must have a very marked influence on the rapidity of its application, and, consequently, on its cheapness. The thought may occur to the minds of some present, "but in taking off the impressions, does not the board get foul, and the pores of the wood clogged up?" The thought is a natural one. My answer is, that with the colour properly prepared, and adapted for its purpose, it does not, any more than does the plate of the copper and steel plate printer; but such a result would occur in both cases if the material used was not suitable for When a board has been used it is its purpose. treated as all other plates are, a cheap material is used for dissolving the printing colour, a handful of fine sawdust is then rubbed over it, which most effectually draws out of the pores of the wood the dissolved colour, and leaves the board clean, and ready for further use when required. Another question may arise in some minds, "but what about the durability of the boards?" The answer to that question may, at first sight, appear startling, but I am satisfied it is correct. The fact is that, under the same conditions, provided no accident happen to it, the board will be far more durable than either the copper or steel plate. I have arrived at that conclusion, not only from close observation, but from actual experience, for it is a fact that there are boards at Messrs. Thomas Simmons and Son's, Manchester, at Messrs. Minton and Co.'s, Stokeupon-Trent, and at the carriage works of the North Staffordsnire Railway Company, which have been in something like regular use for nearly three years, and my conviction is that they are in as good a working state at the present time as they were the day they were first used. Nay, more: I believe that some boards, with careful and constant use, improve rather than deteriorate.

There is one other point I will allude to before passing to the other important branch of the subject, and that is with respect to the variety of That question has sometimes met me in a very blunt form. I have been told that there would be either great sameness in the work, or I must take a timber yard with me. My answer to this is, not necessarily either the one or the other. For example, I take a board of the size already named (5st. long and 12in. wide), this I use on both sides, and from one such board I obtain 10ft. superficial variety of pattern, and in applying the impressions, it does not follow that they should all be applied precisely the same way; so that half-adozen boards of the size named would give 60ft. superficial of variety of pattern, and that variety would be trebled by judicious application, and would give ample variety for the largest room in a nobleman's mansion. But there is no necessity to limit the number, if greater variety is desired. But there is no necessity the boards being cheap enough, only costing about

The second division of the subject, and the one to which I shall now direct your attention, is the important one of quality and cost. In dealing with of the work you will be able to judge from the specimens it is my privilege to submit to you; and this, perhaps, may be a fitting time to make the statement, that I have had specimens at three industrial exhibitions; at two of them I was specially requested to meet the adjudicators of the prizes to explain the process to them, so as to enable them to form an opinion as to whether the patent possessed any commercial value, and in all the three cases. I was awarded either a prize or a certificate of merit.

I have taken considerable pains to bring my specimens and process under the notice of architects. both in London and in the provinces: in some cases an audience has been denied me, by some have been told plainly enough that they hate all imitations, but by others I have met with a very courteous, and, sometimes, a flattering reception. I will content myself with giving three illustrations in connection with architects; one of a large building firm in your own city, and two of practical grainers of eminence, one in London and the other in Manchester.

Mesers. Thomas Simmons and Son, builders and decorators, of Manchester, were among the first to adopt my process, and, after three years' experience of its practical value, have arranged with me for an exclusive licence for the city of Manchester and Salford. Shortly after they introduced it. they were employed to erect a mansion for a gentleman who had seen my specimens, and who wished to have the graining done by this process. The architect objected to it, but the proprietor persisted and carried the point. When the mansion was com-pleted, the architect, the proprietor, the builder, and the patentee met to look over the work. After the inspection. I took the architect to the entrancehall, to a point where the imitation was worked up to the solid oak, and where we had a good view of both; and, while looking at the work from that point, I asked the architect whether he thought was more than one person in a hundred who would be able to say where the solid ended and the imitation commenced. He replied very frankly that he thought there was not. I replied, that being so, I thought my process ought to have fair play, and it ought not summarily to be put out of court. He said he quite agreed with me, and that it had worked out much better than he thought it would You will readily imagine that I was perfectly fied with the result. I had fought the battle satisfied with the result. I had fought the battle of imitation, and won. The next illustration I shall cite took place in one of our largest provincial The architect has attained to considerable eminence of his profession, and the case afforded me some amusement. After a careful examination of my specimens, and listening to what I had to or my specimens, and astening to what I had to say in their favour, he called his chief assistant, and pointing to the specimens, asked him what he thought those were. He replied very promptly and emphatically, "I suppose sir, you call them shams." His reply was, "No, I shall not; these are not shams; they are a transcript from the wood itself and therefore must be both true and itself, and, therefore, must be both true and natural." Before we separated he thanked me for Before we separated, he thanked me for bringing the subject under his notice. The last professional illustration has reference to Mr. Robson, the corporation architect, of Liverpool. In that town new public offices have been erected, and about two years ago, the question arose as to what material and design should be adopted for decorating the dados in the corridors and staircases. After mutual deliberation, and having had several specimens put in position, Mr. Robson decided to apply the enamelled parqueterie tiles manufactured by Messrs. Minton and Company, as licensees under my patent. When the work was finished. Mr. Robson expressed his opinion that the parqueterie tiles had worked out very much to his satisfaction.

The building firm whose opinion of the quality of my specimens I shall now have the pleasure to quote, is among the most famous in your city; I allude to the builders of the new Foreign Offices, Messrs. George Smith and Co., of South-street. Judging from the solid oak work inside that building, I may safely say, that if any persons in the kingdom are competent judges of quality of work, they are; and I esteem the opinion expressed by Mr. Taylor, of that firm, of the utmost value to me. While Mr. Taylor was examining my specimens, Mr. Smith, jun., of that firm, came into his office. Mr. Taylor, after directing his attention to them, remarked, "This is what we are got to now; we cannot tell the solid from the imitation of it. I think I know as much about wainscoting as most men, and I defy any man to tell these specimens from solid wood." It is gratifying to me to be able tuem, instead of giving my own opinion, I shall from solid wood." It is gratifying to me to be able give that of others—persons of refinement and taste, and of large practical experience. Of the quality much as that class is the most sensitive on the

subject. The first is that of Mr. Mannooch, a name well known in London to the trade, and any opinion of his on the subject of graining, I am happy to know, is received with great respect. In showing my specimens to him, he remarked that he should like to see the process applied; and as he was erecting a house at St. John's wood, it was arranged that I should grain the drawing-room oak. The question of price per yard was left to him. the work was completed and varnished, he told me he should pay me 2s. per yard for it—which was double what I expected; that if he had known of it thirty years ago, he could have made a fortune out of it; and that I might with pleasure use him as my London referee. The other illustration is that of Mr. Bardsley, of Manchester—perhaps as good a grainer as is to be found out of London. I showed the process in Manchester to four gentlemen, of whom Mr. Bardsley was one. The article decorated was a piece of furniture. When I had finished, Mr. Bardsley said that I had done as much work in ten minutes as he could do in a day, to do it of the same quality. One of the other gentle-men replied, "Mr. Bardsley, you could not do it of men replied, "Mr. Bardsley, you could not do it of the same quality as that if you did take a day to do it. Mr. Bardsley smilingly said, "Well. perhaps I could not"; and added, "the simplicity of the process has taken me more by surprise than the quality of the work."

It would be easy to multiply illustrations, but I fear that I have already trespassed at too great length on your patience, and I must hasten on to deal with the question of cost, although you will not have failed to perceive that my last illustration touches both quality and cost.

(To be continued.)

## THE PROPOSED HURON AND ONTARIO SHIP CANAL.

THE promoters of this project state that they have A secured a subscription of 20,000,000 dollars from capitalists, in the United States, and have made a contract with an English contractor for a like amount, both dependent upon the condition that the Canadian Government shall donate to the company ten millions of acres of public land. This canal, its route, engineering features, and works throughout, may be briefly described as follows:—It will connect Lake Ontario (234ft. above the sea), with Lake Huron (574ft. above the sea), and have Lake Simcoe (704ft. above the sea), situated midway between them, for its summit level and feeder. The distance between its southern terminus, in Humber Bay, of Lake Ontario, and its northern terminus in Georgian Bay, of Lake Huron is 100 miles, of which 24 miles are deep water navigation through Lake Simcoe, and 16 miles slack water navigation in the northern extremity of the Nottawasaga river to its mouth in Georgian Bay; so that there will be only 60 miles of canal proper, of which 30 miles will be summit level, and only 30 miles interrupted by lockage. The canal will, therefore, be in two divisions—one south of Lake Simcoe 47 miles in length, and the other north of Lake Simcoe, and (including the Nottawasaga river), 29 miles in length. The southern division will commence in the Humber Bay, at a point about twenty-five chains west of the mouth of the Humber river, where it is proposed to make three lift locks in the solid ground, elevating the canal 45ft., and carrying it, by means of a stone aqueduct, over the Lake Shore-road, Great Western Railway, and side road. From the northern extremity of this aqueduct, the canal will be continued through the solid ground, to the village of Lambton, a distance of three miles, where it will join the river and receive its water supply. Following the valley of the Humber river for a bout three miles farther, to Weston, it will secured a subscription of 20,000,000 dollars from capitalists, in the United States, and have made of three miles, where it will join the river and receive its water supply. Following the valley of the Humber river for a bout three miles farther, to Weston, it will there intersect the Grand Trunk Railway, which is carried over the valley of the Humber by a viaduct about 60ft. above the water level. There the canal will be brought, by the necessary excavation in the bed of the stream, underneath the railway, at a level to afford 100ft clear headway for the passage of masts of vessels; its elevation to the natural level being effected, after passing beneath the viaduct, by three lift locks.

From Lambton, the canal will follow the valley of

three lift locks.

From Lambton, the canal will follow the valley of its eastern branch, to the From Lambton, the canal will follow the valley of the Humber river and its eastern branch, to the boundary line between the townships of Vaughan and King; in which distance of 21 miles, an ascent of 470ft. to the summit level will have been effected by means of thirty-one locks, of an average lift of 15ft. 2in. At this point, the largest feature of the work will be encountered. The highlands of the townships of King, there continue to rise until they attain a height of 186ft, above the level of Lake Simcoe (the summit) and then decline to that level townships of King, there continue to rise unit incy attain a height of 186ft, above the level of Lake Simcoe (the summit), and then decline to that level, within a distance of nine miles. The average depth of the necessary cut through this ridge is about 80ft, and the total excavation is computed at 36,000,000 cubic yards. It has been satisfactorily ascertained, by test-pits and boring, that the nucleus of this elevated ground consists of indurated clay and gravel, very similar to the exposed cliffs on Yonge-street, near York-mills, which appear to be a portion of the same g-ological formation; and that the upper or surface portion is clay, gravel, and sand of a friable nature. Notwithstanding the admitted formidable

surface portion is clay, gravel, and sand of a friable nature. Notwithstanding the admitted formidable nature and magnitude of this cutting, it is confidently believed that there is no insuperable obstacle in the way of its accomplishment, in a permanent and satisfactory manner. Through the entire length of this cutting there will be massive continuous piers, formed of boulders and concrete, and faced with close piling, secured to back stay piles, on both sides, to protect the foot of the slope.

This cut will bring the caual to its connection with the Holiand river, the course of which it will follow, through an extended flat, known as the Holland Marsh, for 14 miles, to its mouth on Lake Simcoe, Passing through Lake Simcoe, and out of it at Kemperfeldt Bay, another cut or excavation will be necessary, averaging for about 50ft, for five miles, to reach the Nottawasga river, the course of which will be followed to within threemiles of its mouth, in Nottawasga Bay, where, in order to save an extensive bend in the river, there will be a cut of about 40ft, deep, 1; mile through a sand hill with clay bottom. This last cut will bring it to its northern terminus. On the northern division of 29 miles, there is a descent of 130ft, effected by eleven locks, of which six will have an average fall of 15ft., and five of 8ft.

will have an average fall of loft, and five of sft.

There will be the railway and road crossings over
the Holland river near Bradford, where the unsatisfactory character of the ground calls for special
structures, to secure sufficient foundations for iron

The total lockage on the canal will be 600ft., and the number of locks forty-two. The width of the canal will be 100ft, at the water surface and 80ft, in the bottom, and its depth 13ft, except where these dimensions are necessarily exceeded by the width of the valleys and channels of the rivers through which it will pass, and through the deep excavation, where its width will be 80ft, both at the surface and bottom, with vertical piers on both sides. All the locks will be detached, to prevent the loss of time and consequent diminution of practical capacity for traffic, which would attend the grouping of locks together, in combination. The locks, sluices, and swing bridges will be operated by hydraulic power, except at the summit level, where steam power will be used. The works, throughout the line, will mainly consist of a stone aqueduct, to carry the canal over the Great Western Railway and two public roads; modification of the western viaduct to allow the passage of the canal under the Grand Trunk Railway; about 10,000,000 cubic yards dredging in the rivers; about 50,000,000 cubic yards excavation; 16 miles retaining piers on both sides of deep excavation; 60 miles of other slope protections; 42 locks complete, 250ft, by 35ft, with 13ft, on the sills; 25 miles iron hydraulic main, for operating lock gates, sluices, and swinging bridges; four special railway bridges; twenty-four iron swing bridges, for ordinary road crossings; entrance harbours at each terminus; dams, waste-weirs, offlets, culverts, and inlets; crib protections in Lake Simcoe; offices, workshops, storehouses, lock and bridge keepers' houses; 145 miles of towing path; about 140 miles permanent fencing. The time required for passing through the canal is computed at 42 hours thus: the number of locks forty-two. The width of the canal will be 100ft, at the water surface and 80ft, in permanent fencing. The time required for passing through the canal is computed at 42 hours thus:—

24 miles lake navigation, at 8 miles per hour 521 miles river and canal, long reaches, 31 miles per hour . 20 miles river and canal, short reaches, 2 miles 

Total

This rate of speed applies to steam propelled vessels. Sailing vessels, to attain to it, must be towed. Steam tugs will be specially provided for towage through the long reaches, and the hydraulic power for operating the lock gates, sluices, and swing bridges will be available for the short warping ponds. The estimated cost of all the works is 36,000,000 dollars, to which must be added the interest on expenditure during the construction, which, together, will absorb the authorized capital of 40,000,000 dollars.—"American Railway Times."

#### PHENOMENA OF LIGHT.

FEW would deny that the Parisians are a most ingenious race, but their ingeniuty is, perhaps, nowhere more conspicuously displayed than in devices by which they contrive to show their political devices by which they contrive to show their political opinions without unpleasant consequences to themselves. On Sunday last, says the "Pall Mall Gazette," one of the "conferences," now so much the fashion in Paris, was held at the Theatre de l'Ambigu-Comique on "the phenomena of light." a subject one would have thought about as unpolitical as could well have been chosen. Not a bit of it. as could well have been chosen. Not a bit of it.

The lecturer, in order to demonstrate certain theories, proceeded to enlarge some photographs of celebrated persons. Now, this being done by means of a strong magnesium light, all the theatre, except in the immediate neighbourhood of the operator, was in almost total darkness. The audience could be heard,

not seen. The portrait of the Emperor was received with a storm of hisses and cries of "A la porte!" "Vive la Republique!" "Il s'en ira bientot!" &c. "Vive la Republique!" "Il s'en ira biento!!" dc. That of the Empress met with a worse reception, if possible, than her husband's. On the other hand, the portrait of Maximilian was received with cheers and cries of "Qui l'a trahi?" Maximilian, as a bystander remarked, probably owed his popularity to the fact of his having been shot. The operator, like a prudent man, soon brought his experiments to an end, and when the gas was turned on the "agents" were very busy looking about, but, of course, every one looked intensely loyal. Can any one fancy a similar scene at one of Professor Tyndall's lectures?

#### AMERICAN ORDNANCE.

THE report of the Joint Committee on Ordnance, made in the Senate of the United States, by Mr. Howard, condemns both the Rodman system of gunmaking, adopted in the army, and the Dahlgren system, which is used in the navy. These systems, the report says, while partially successful with smooth-bores, have uniformly failed as rifles. Several of the Rodman guns have burst spontaneously while being finished in the foundries. The committee recommend that no more of them be purneously while being finished in the foundries. The committee recommend that no more of them be purchased, but that experiments be made to determine upon some more reliable system of fabrication. The failure to secure better guns than heretofore, the committee attribute to the fact, that officers have been gun inventors, and have secured by their influence the adoption of their inventions without regard to merit. The report is accompanied by a bill which places all experiments and the selection of arms for both army and navy in the hands of an of arms for both army and navy in the hands of an Ordnance Commission, to be composed of three army and two navy officers, and two civilians eminent for their attainments on the subject. The bill abolishes the Ordnance Department of the army by merging it in the artillery.

### Correspondence.

#### EXPLOSIVE COMPOUNDS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR—Observing a letter on the subject of explosive compounds in your impression of the 26th ultimo, I take the liberty of intruding upon your valuable space, in order, as far as my experience enables me, to correct some statements made therein. valuable space, in order, as far as my experience enables me, to correct some statements made therein. Mr. H. W. Reveley somewhat positively asserts that a large portion of black powder is always blown out of the gun unconsumed, perhaps to the amount of half the whole charge; that black grains may be seen to issue from the muzzle of a gun; and that it is advantageous for the whole of the charge of powder to be ignited instantaneously. With regard to the last statement, I cannot do better than quote his own words—"The sudden ignition of the whole charge is objected to by practical men, gunsmiths especially, who say, following an erroneous idea of Sir W. Armstrong's, that slow-burning powder is what is required for artillery, both large and small." It has been proved by actual experiment that slow-burning powders produced high velocities with rifled arms; thus, a charge of 20 grains of gun-cotton generates a larger volume of gas than 70 grains of gunpowder, but does not communicate so high a velocity to the bullet as the latter, simply on account of its excessive rapidity of combustion. Having had some experience in rifle shooting, I have never seen the black grains issue from the muzzle, although I should have been curious to do. 9 and should seen the black grains issue from the muzzle, although I should have been curious to do so, and should

I should have been curious to do so, and should imagine it would require superhuman eyesight to perceive them, even if they did issue.

If Mr. Reveley fancies that only one-half of the ordinary charge of powder acts propulsively on the bullet, he might easily fire some half charges and ascertain the initial velocity of the bullet. I cannot understand how, by the use of a quicker and, therefore, more dangerous powder, the weight of firearms can be reduced by one-third, especially as, in another part of the letter referred to, Mr. Reveley suggests increasing the thickness of metal in the breech of guns.

As one taking great interest in rifle shooting. I As one taking great interest in rile shooting, is should have been pleased to have seen the results of practical trials, proving the driving power of the powder referred to, as to volume and weight of charge, velocity and weight of projectile, and also some sort of proof as to its safety, by the firing of excessive charges.—I am, Sir, yours, &c. F. W. R.

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. Sd. yearly, or 10s. 10d. half-yearly payable in

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We must absolutely decline attending to any communi-cations unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ep. M. M.

faith. En. M. M.
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### Meetings for the Week.

Tuss.—Royal Institution.—Rev. F. W. Farrar on "Comparative Philology," at 3 p.m.

The Institution of Civil Engineers.—Mr. Zerah Colburn, M. Inst. C.E., on "American Locomotives and Rolling Stock," at 8 p.m.

Wed.—Civil and Mechanical Engineers' Society.—Mr. B. Haughton, President, on "The Proposed Reconstruction of the Devenport and Torpoint Ferry and Landing Stages," at 8 p.m.

THURS.—Royal Institution.—Dr. H. Power on "The Eye," at 3 p.m.

THURS.—Royal Institution.—Dr. H. Power on "The Eye," at 3 p.m.

FRI.—Royal Institution.—Professor Abel on "Naval and Military Applications of Electricity," at 8 p.m.

Royal United Service Institution.—Mr. W. Cave

Thomas, Captain of the 19th Middlesex Rifle

Volunteers, on "Suggestions for Improving
Our System of Recruiting," at 3 p.m.

SAT.—Royal Institution.—Professor Odling on "Hydrogen," at 3 p.m.

### Habal, Military, and Gunnery Items.

THE navy estimates show a net decrease as compared with last year of £957,357.

DURING the past year, 1868, 3,547 vessels entered the port of Antwerp, and 3,504 sailed during the same period.

WE have to announce the death of Field Marshal Viscount Gough, the hero of Moodkee, Ferozeshah, and Sobraon, in his ninetieth year, which took place on Tuesday last.

THE Bavarian Minister of War has demanded from the Chamber a credit of 4,500,000 florins for new breech-loading rifles. In the course of his explanations he informed the house that the Dreyse system (Prussian needle-gun) had been rejected.

MAJOR CHARLES FREEMAN SANDHAM, late of the Royal Artillery, one of the few remaining survivors of the Waterloo officers, died on February 14, at his residence, Rowdell, in the county of Sussex, aged

THE precise number of lives lost in the catastrophe of the frigate "Radetzky," near Lissa, was 342, including the captain and all the officers, except one midshipman. Only twenty-three persons were saved, five of whom are seriously injured, and five others slightly.

THE Board of Trade are about to present to Captain F. Mahe, of the "Manille," of Havre, a pold watch and chain, in recognition of services rendered to the master and crew of the "Glengall," of Picton, Nova Scotia, who were rescued from the wreck of that vessel by the "Manille" in 1867.

THE Lords Commissioners of the Admiralty have issued a similar notice to that from the War Depart-ment which will be found on another page, to in-ventors, defining the grounds upon which alone any claim for pecuniary compensation will be recognized on account of plans and inventions adopted into the

An article, giving the history of fire-arms, in the French official journal, says that in 1428 the English employed fifteen breech-loaders against Orleans, and that some of the old Italian guns made of ribs of wood covered with hide are still to be seen in the arsenal of Genoa. These are the guns to which Machiavelli alludes.

On the evening of February 11 the steamer "Nellie Stevens" was destroyed by fire on the Red River, at Caddo Lake, and is a total loss. Sixty-three lives were lost, and but forty-three persons were saved. Among the lost were a large number of women and children. The cargo was chiefly hay, causing the fire to spread with great rapidity.

A NEW description of iron pavement has peen laid down in Chatham dockyard for experimental purposes. The principal merit of the new pavement over the old iron tramway formed of "Seeley's pigs" of iron ballast is that there is far less friction to be overcome in the heavily-laden vehicles passing over it, while about a quarter of the number of "pigs" at present in use will suffice for an equal length of paving.

THE "Bureau Veritas" of Paris, in its monthly ist of marine casualties, shows that in the month of January last the number of vessels totally lost was 269, of which 123 were English, 28 American, 18 French, 12 North German, 7 Dutch, 6 Norwegian,

and 36 of various other nationalities. The total number of disasters contrasts favourably with the records in previous years, the losses in January, 1866, having been 410, of 1867, 421, and in January, 1868, 264.

THE Naval Committee of the United States' House of Representatives reported on February 12 a bill to pay to Commodore Winslow and the officers bill to pay to Commodore Winslow and the omeers and crew of the war steamer "Kearsarge," the sum of 190,000 dollars as prize money, that sum being the estimated value of the "Alabama," which was destroyed by the "Kearsarge." An amendment was adopted providing that no part of the money should be paid to an assignee of any mariner, and the bill was passed.

WE are informed that the Moncrieff gun carriages. on the protected barbette system, which are now on the protected barbette system, which are now to be introduced into the service, will be constructed at the Royal Carriage Department, Royal Arsenal, Woolwich, under the superintendence of the inventor, who is to receive an annual salary as long as his services are required while the work is going ou, with a sum paid down for the invention. This fresh work will be gladly received by the workmen, numbers of whom are in receipt of little or no wages.

wages.

THE Parliamentary Navy Vote for the financial year 1869-70 will provide for 3,352 commissioned officers, 664 subordinate officers, 1,063 warrant officers, 28,401 petty officers and seamen, 7,000 boys on service or under instruction, 7,250 officers, men, and boys in the Coastguard Service afloat and on shore, 1,270 officers, men, and boys for troopships in the Indian service, and 14,000 officers and privates of Royal Marines, making a total of 63,000, without reckoning the 300 civilians in the Coastguard service. The vote for wages, &c., is £2,762,353. The vice. The vote for wages, &c., is £2,762,353. The vote of men and boys last session was for £66,770, with 350 civilians for Coastguard service.

On Tuesday and Wednesday last, a series of experiments were carried out at Shoeburyness; they included further trials of the Lancaster semi-oval rifled gun, Colonel Shaw's muzzle pivoting carriage, and a Frazer 9-inch gun against the new 8-inch armoured target, with simple wood backing. The Lancaster projectiles did not obtain rotation, insufficiency of twist in the rifle being stated as the consellation of the control of the state of the stat possible cause. Colonel Shaw's carriage endured the test well. The target constructed by Messrs. Cammell is a very fine one, and made better resist-ance than was anticipated. The 250-pounder shot and shell failed to perforate it.

THE "Patrie" tells the following story of a flag-It says that the chasseurs of the Guard had for duty to accompany the Emperor wherever he went. There were several squadrons of Mamelukes in the regiment, which was officered by men who had earned a place in history by their bravery. At Waterloo the chasseurs were commanded by General Lallemand, who escaped from that fatal field with the standard of the regiment. He sought refuge in America, and, when dying, he confided his treasure to King Joseph, who was also residing in the United States as Count Survilliers. King Joseph, when he returned to Europe, brought back the old flag, and left it in his will to such grandson who should embrace the career of arms and be worthy of the favour. This standard has just been handed to Prince Charles Napoleon Philippe Gregoire Bonaparte, Captain of Infantry, son of Prince Charles, and grandson of Lucien Bonaparte. It says that the chasseurs of the Guard had for duty Bonaparte.

## Miscellanen.

BAVARIA has just suppressed the monopoly of salt, with a view to the interest of agriculture.

THE heritors of the parish of Jedburgh have resolved, by a majority, to restore the Abbey Church at a cost of £4,200.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending February 27, was 4,226. Total number since the opening of the Museum, free daily (May 12, 1858), 1.511.462.

WE hear that in consequence of the anticipated drought at Mallingham, India, for the next four months, government have sanctioned four of Norton's American pumps being sunk in the bed of the river, running within 400 yards of the cantonment, and which is already at this early period quite dry.

A PROVIDENCE (Rhode Island) paper announces that a rope-walker will begin on June 1 the feat of propelling a velocipede 8,000 miles in thirty days. averaging 100 miles a day, for a wager of 5,000 dollars. During the trip he is to ride the velocipede 150 miles in twenty-four hours, and only one trial will be allowed.

THE number of visitors to the South Kensington Museum during the week ending February 27, 1869, was—on Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., 12,784; Meyrick and other galleries, 2,127; on Wednesday, Thursday, and

Friday (admission 6d.), from 10 a.m. till 4 p.m., 1,749; Meyrick and other galleries, 174; total—16.834. Average of corresponding week in former years, 10,881. Total from opening of Museum—8,193,125.

In consequence of the inundations of the salt mines of Wieliczka the Austrian government had charged a committee of seven of the principal engineers to institute an inquiry on the subject. These functionaries have now sent in a report to the effect that the irruption of water is not of a nature to destroy the mines or prevent their working; and that the pumps for emptying the pit are now nearly all set up.

MR. EDWIN CHADWICK, C.B., recently presided at a meeting of the Social Science Association, in the Adelphi, for the discussion of a paper by the Rev. Brooke Lambert, "On the Position of the National Schoolmaster." The great drawback pointed out by Mr. Lambert was that the national schoolmaster had no chance of rising, to remedy which he recommended that school inspectorships and the mestership of endowed schools should be which he recommended that school inspectorships and the mastership of endowed schools should be opened to him opened to him.

AT the monthly ballot of the Institution of Civil Engineers, on Tuesday last, the following candidates were balloted for and duly elected as Members: Messrs. W. J. Forrest, J. Johnson, H. N. Maynard, and E. R. Scott: as Associates, Messrs. C. Barnard, J. H. Blake, H. Chubb, A. D. Fox, R. A. Robertson, Major J. H. M. S. Stewart, R.E., Captain E. T. Thackeray, V.C., R.E., and Mr. F. Turner. It was announced that the following gentlemen had recently been admitted as Students of the Institution:—Messrs. J. G. Barton, H. M. Bell, H. W. Dallas, T. Inman, S. Moyle, and H. O. Smith. AT the monthly ballot of the Institution of Civil

S. Moyle, and H. O. Smith.

At the ordinary meeting of the Society of Engineers, held on the 1st inst., Mr. F. W. Bryant, President, in the chair, a paper was read on "Electric Telegraphy, irrespective of Telegraphic Apparatus." by Mr. E. G. Bartholomew. The following candidates for election were balloted for and duly elected as Members, viz:—Messrs. Wm. Martley, Locomotive Superintendent, London Chatham and Dover Railway, Longhedge, Wandsworth; John Baldwin, Engineer, Novarino-road, Dalston; John Blackbourne, resident engineer, Limehouse Basin Works; and, as Associate, Mr. James William Restler, New Water works. Hampton. works, Hampton.

AT the meeting of the Royal Horticultural Society At the meeting of the Royal Horticultural Society on Tuesday there was a rich display of orchids; the Duke of Edinburgh rose was the gem of the show, while on a smaller scale a group of different species of primula and a collection of spring flowers attracted much attention. Mr. James Bateman, F.R.S., presided, and the following candidates were elected fellows, viz:—N. B. E. Baillie, H. P. Baylis, Sir J. R. Blois, Bart., Clement C. Dormer, W. P. Elzee, Mrs. Elliott, Captain Baskervyle Glegg, Sydney Kennedy, Colonel A. R. Manson, James D. Purks, Frederick Payne, Henry George Quilter, St. Barbe Slayden, Jacob Walter, James Parker Woodhouse, &c.

PROFESSOR W. A. MILLER has announced the discovery of a means by which the red prominences which form so remarkable a feature of solar minences which form so remarkable a feature of solar eclipses may be seen at any time. The method consists of intercepting by means of coloured glasses all the components of solar light except those of which the prominences are composed. The chromosphere, as the surrounding stratum of hydrogen discovered by Mr. Norman Lockyer is called, being of the same composition, will also be thus visible. This discovery will enable astronomers easily to observe the disturbances in the prominences, and their connection with the spots and other solar phenomena.

The President of the United States has sent to the Senate for ratification the treaty he has concluded with the government of New Granada respecting the Darien Ship Canal. This treaty, it is understood, gives the exclusive right to construct the canal to American citizens, and its ratification is regarded as secure. The canal must be completed fifteen years after the ratification of the treaty, and the capital necessary for the undertaking is said to be already pledged. From Nicaragua it is announced that the Government of that State has concluded a treaty with M. Chevalier, the French senator, as the representative of a French company, giving them the right to construct a canal to connect the uceans, across Nicaragua. THE President of the United States has sent to across Nicaragua.

across Nicaragua.

At the general monthly meeting of the Boyal Institution of Great Britain, held Monday, March 1, 1869, Sir Henry Holland, Bart., president, in the chair, Peter Allen, M.D., Frederic Kett Barclay, Esq., Mrs. Bowie, Thomas Boycott, M.D., F.L.S., Henry Chester, Esq., Professor A. H. Church, M.A., Charles Cogswell, M.D., Mrs. Charles Crokat, Edward Dent, Esq., William Gardiner, Esq., Gilbert F. Girdwood, Esq., Walter Henty, Esq., Charles Latham, Esq., John Macdougall, Esq., Edward Moberly, jun., Esq., Robert Palmer, Esq., Rev. George C. Pearson, M.A., Alfred Rowlls Rowlls, Esq., Archibald Travers, Esq., Alfred Wills, Esq., were elected members of the Royal Institution, F. Leighton, Esq., was admitted a member of the Royal Leighton, Esq., was admitted a member of the Royal Institution.

UP to the close of 1850 the value of the Californian gold exported from San Francisco was 66,000,000dols. In the eighteen years which have since elapsed the value of the gold exported from the great Pacific

value of the gold exported from the great Pacific port has been as follows:—

dols.

dols.

dols.

dols.

dols.

1851, 45,989,000

1857, 48,976,692

1863, 46,071,920

1853, 45,955,000

1859, 47,640,462

1865, 44,46,172

1854, 52,045,633

1860, 42,325,816

1865, 44,46,172

1854, 52,045,633

1860, 42,325,816

1863, 44,365,668

1855, 45,161,731

1861, 40,676,788

1863, 36,338,996

The aggregate from 1848 to 1868 inclusive was thus no less than 897,968,267dols. It must not be assumed that all this was gold newly raised from the earth, as it included coin; still, there can be no doubt that a very large proportion was virgin gold.

doubt that a very large proportion was virgin gold. The yield of the precious metals in the United States, during 1868, is estimated at 66,500,000 dollars. California produced the largest amount, 20,000,000 dollars, and after it come Nevada, 18,000,000 dollars; Montana, 12,000,000 dollars; Idaho, 6,000,000 dollars; Oregon, 5,000,000 dollars; and Colorada, 4,000,000 dollars. Washington, New Mexico, and Arizona territories produced smaller amounts. The yield is regarded as stationary, with the prospect that the opening of the Pacific Railway, which runs through several of the gold and silver regions, will have a tendency to increase it. The influx of Chinamen, too, lessens the cost of labour on the Pacific coast. It is announced that much of the capital that was invested in American gold and silver mining enterprises during 1868 came from England.

An Indian journal gives the following as the

An Indian journal gives the following as the ntents of the stomach of a crocodile lately captured contents of the stomach of a crocodile lately captured near Agra:—About a dozen large bunches, pellets, of hair (probably human); 68 rounded pebbles, averaging in size from nearly 3in. to lin. in diameter, 1 large aukle bangle ring of mixed metal; 24 fragments, of various sizes, of vitreous armlet rings; 5 bronze finger rings; 1 small silver neck-charm; a small defaced silver coin, with a metal loop, for suspension, attached to it; one gold bead, about one-third of an inch square; 1 largish bead, of black stone veined with white; and thirty small red necklace beads. All these things (barring the stones) it is taken for granted must have been the ornaments of some woman (if not more than one) who had been of some woman (if not more than one) who had been devoured by this monster. The skeleton of the devoured by this monster. The skeleton of the crocodile was being prepared as a specimen for the Reddell Museum, Agra.

## Patents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclu-sively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledg-ment:—

ment:—
BOILERS AND FURNACES—2479, 2484, 2497, 2517
BUILDINGS AND BUILDING MATERIALS—2481, 2518
CHEMISTRY AND PHOTOGRAPHY—2480, 2491
CULTIVATION OF THE SOIL, including agricultural implements and machines.—2526, 2536
ELECTRICAL APPARATUS—2492, 2496, 2505, 2523
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2472, 2475, 2477, 2515, 2522, 2524, 2527, 2535, 2537, 2538
FOOD AND BRYERGES, including the apparatus for pre-

2535, 2537, 2538

FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—None.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—2470, 2482, 2504

9470, 2482, 2504

GRNERAL MACHINERY—2525, 2539

LIGHTING, HEATING, AND VENTILATING—None.

MEFALS, including apperatus for their manufacture—2501, 2511, 2514, 2540

MISCELLANEOUS—2469, 2471, 2473, 2474, 2476, 2486, 2487, 2489, 2493, 2494, 2496, 2498, 2500, 2503, 2507, 2508, 2516, 2519, 2520, 2524, 2528, 2530, 2533

BOADS AND VEHICLES, including rallway plant and carriages, saddlery, and harness, &c.—2506, 2510, 2531

SHIPS AND BOATS, including their fittings—2502, 2529, 2532

2552 STEAM ENGINES-2485, 2488, 2490, 2499, 2512, 2513 WARFARE-2468, 2478, 2483, 2534

2463 A. M. CLARK, Chancery-lane, Scisors. Dated August 6, 1868.

This consists in jointing the tangs or legs of scissors, so that the bows may be folded against the blades, to enable them being carried in the pocket without danger.—Patent completed.

completed.

2464 W. and E. M. HANN, Durham. Safety lamps. Dated August 6, 1868.

The object of this is to protect the flame of the lamp from pressures of wind, that only sufficient air be admitted to supply the combustion of the flame. The improvements relate chiefly to the class of lamp known as the Stephenson lamp, in which a glass chimney is employed, within an outer casing of wire gauze. In order to prevent the passage of any current of air or gas between the gauze and lower end of the glass chimney, the patentees fit the bottom of the glass to the upper surface of a ring, which has projecting from its upper surface a cylindrical flange, which

fits within, or it might be to the outside of the glass, such glass chimney being fitted both to the flat aurface of the ring and to the flange by grinding. The cylindrical gauze casing, which surrounds the glass, is continued down below the glass, and through this lower part of the gauze, air is admitted to the lamp; the outer circumference of the ring which carries the glass fits accurately to the interior of the gauze casing above the point of inlet of air; whilst at the point, the exterior of the gauze is embraced by the lower framework of the lamp, the gauze being thus held between two metal surfaces fitting closely against it.—Patent completed.

2465 W. B. LANE Chancervalane. Felled fabric. Dated

2465 W. B. LAKE, Chancery-lane. Felted fabric. Dated August 5, 1868.

This relates to imparting a stiffness and body to felts. by incorporating hair, preferably horsehair, in the body thereof.—Patent completed.

2466 A. V. NEWTON, Chancery-lane. Boots and shoes ated August 6, 1868.

2466 A. V. NEWTON, Chancery-lane. Boots and shows Dated August 6, 1868.

A base or core extending from toe to heel is made of thin sheet iron, which is stamped out to the required size and shape, but with spurs all round, except at that part which forms the waist. These spurs, when bent up, as will be presently explained, will serve to form a kind of wall or square edge to the sole and heel, and determine the thickness of filling they shall receive. The base plate is protected by a canvas covering secured thereto, by japan or varnish, a thick prepared canvas being applied to the under side of the core, or that part of it which is known as the tread. Over this canvas is applied another coating of prepared canvas, and these fabrics are secured to the metal, core by means of burrs, or sharp teeth punched out of the metal, and projecting vertically from its under face.—Patent completed.

2467 W. M. MOORE. Dublin. Paper holders. Dated

of the metal, and projecting vertically from its under lace.—Patent completed.

2467 W. M. MOORE, Dublin. Paper holders. Dated August 6, 1868.

Two boards of wood are connected by a flexible hinged joint. The two boards are held firmly but elastically together, by being nipped between a pair of laths or strips of wood, or other suitable stout material, such laths being held together by india-rubber, or other suitable springs, applled to their extremities; a ridge or projection is formed near one edge of both the boards, to prevent the laths from being accidentally disengaged from or stripped entirely off the boards. When these laths are brought into a diagonal position, so as to pass across the joints, in one of the boards, the entire surface of that board will be maintained flat against the documents, effectually covering or protecting them, and securing them in their places, but by moving the laths along the board, so as to leave one or other of the joints free, then the corresponding parts of the jointed board may be folded or turned down, so as to expose any desired portion of the document, or (if the document is provided with a wide margin) to expose the whole of the writing on one side, the margin alone being concealed and held between the boards.—Patent completed.

2468 T. W. STAPLETON, Regent-street. Breech-loaders.

2468 T. W. STAPLETON, Regent-street. Breech-loaders. Dated August 7, 1868.
The striking bolt, together with the hammer, which actuates it, are enclosed inside the lock of the gun, thereby presenting no opening for the admission of dust or damp, and preventing the hammer from coming in contact with any external object. The striking and locking bolt, instead of being hinged to the head of the hammer, as is the case in other rifles; of this description, is imounted, independently of the hammer, the head of which enters a recess or notch at the end of the bolt. The bolt is thus capable of being shot backwards and forwards in the top of the lock. The arm is cocked from below, by means of a lever, which forms the trigger guard.—Patent abandoned.

2469 C. W. CURTIS and A. FIDDES, Bristol. Safes. Dated August 7, 1868.

The frame is constructed of angle iron or metal, and provision is made for the reception of drill-proof rollers, which are to cover the whole surface of the safe. The rollers are inserted in grooved iron plates irregularly.—Patent completed.

2470 E. W. MADDICK, Holloway. Forks and spoons. Dated August 7, 1868.

The patentee fits to the stem of the fork or spoon asilde, so that they can be used as one article, or they can be disconnected and be used separately.—Patent abandoned.

2471 B. HUNT, Lincoln's Inn. India-rubber fabrics. Dated

2471 B. Hunt, Lincoln's Inn. India-rubber fabrics. Dated August 7, 1868.

Sheets of india-rubber are pierced or perforated all over with minute holes, the size, number, and distance apart being varied, according to circumstances, but they must be of sufficient size to allow of air and gases passing through, and to be plainly visible on holding the fabric up to the light; at the same time, they must be sufficiently minute to prevent the passage of water, excepting when pressure is applied.—Patent completed.

2472 J. WHITEHEAD, Manchester. Dandy rollers. Dated August 7, 1868.

August 1, 1808.

The body or framework of the roller is composed of pieces of wire soldered or brazed together in several parts, so as to form a strong skeleton frame, on which the wire gauze or laid work is placed.—Patent completed.

2473 N. SALAMON, Ludgate-hill. Seeing machines. Dated August 7, 1868.

This consists in fitting a curved lever to the back of the head of a sewing machine, to operate the pressure foot, and by which the pressure foot can be lifted clear of the work plate. The pressure foot enters a stop which presses on the spiral spring. A guide wire is employed to lay a braid in line with and under the needle.—Patent completed.

2474 H. BENJAMIN, Abbey-road, Washing machine, Dated

2474 H. BENJAMIN, ADDRY-TORU. WARRING THE AUGUST 7, 1868.

This consists of a hollow quadrangular star-shaped vessel, provided with a covered opening, for inserting or withdrawing the clothes. By this arrangement, the articles under operation (as the chamber revolves) are projected against the angular cavities, and thereby cleansed, independently of any intermediate stirrers or beaters hitherto in use.—Patent completed.

2475 J. LITCHFIELD, Nottingham. Lace machines. Dated

2475 J. LITCHFIELD, NOTHINGHAM.
August 7, 1868.

A twist lace machine of ordinary construction is employed, with two warp threads to each bobbin thread. The warp threads are carried in two warp bars, which have a movement given to them, so that when the jacks or stops do not operate to modify the action of the bars on the threads, the threads carried by one bar twist constantly, each with its own bobbin thread, and the threads

carried by the other bar traverse to and fro over three or other number of bobbins. In producing the pattern or finings, all the jacks or stops are kept out of action. In producing the ground net, the jacks or stops operate obth sets of warp threads; those threads which, as already mentioned, are by their warp bar carried only one gate or space, and are by the jack bar from time to time moved a second gate or space, so as to make a crossing to another bobbin thread—Patent abandoned.

a second gate or space, so as to make a crossing to another bobbin thread.—Patent abandoned.

2478 W. E. Newton, Chancery-lane. Regulating speed.
Dated August 7, 1868.

The piston rod of an engine is connected by a link or connecting rod to one end of a vibrating lever, mounted on what the inventors term the shaft of resistance, at a point above the point of connection of the piston rod with the vibrating lever. On the side of this lever is mounted a small bell crank lever, which is capable of rocking on its centre of motion within certain limits, that is, between two fixed stude, which circumseribe the action of one of the arms of the bell crank lever. This arm is connected by a rod to the mechanism to be actuated, or to the motive engine to be regulated, while its second arm is connected by a rod or link to the arm of another bell crank lever whose centre of motion is fixed, while that of the first bell crank lever is movable, being situated on the vibrating lever. The upper arm of the second lever is connected by a rod to the cut-off valve of the engine, which is worked thereby. Thus, in the event of any irregularity of motion in the mechanism, and which it may be desired to correct or compensate, then the rod which works the first bell crank will move it more or less accordingly, and will, through the second lever and gear, regulate the cut-off of the steam.—Patent completed.

2477 G. Leach, Leeds. Carding. Dated August 7, 1868.

through the second lever and gear, regulate the cut-off of the steam.—Patent completed.

2477 G. LEACH, Leeds. Carding. Dated August 7, 1868. This invention relates, first, to an improved fixing or bearing or stardard, for the small card rollers of engines, known as workers and strippers, whose office it is to take the fibres from and return them to the main cylinder. The object is to make the bearings easily adjustable, both vertically and laterally, and thus to ensure their proper and efficient action. The axle of each worker and stripper is carried in a pair of bracket bearings, which are formed with stems screwed at their lower end, and passed through ring flanges on the sides of the framing. The stems are made fast to the framing by clamping nuts. Each bracket stem is dropped through a socket piece, made fast to the framing by a clamping nut and steady pins. This socket piece is fitted at its opposite sides with set screws, by means of which the bracket stem may be adjusted so as to throw the worker or stripper, as the case may be, forward or backward, while, by the clamping nuts, their vertical adjustment is effected. The invention relates, second, to an improved method of taking up the silver as it comes off the doffer of the carding or scribbling engine. The silver, as it is stripped in the usual way from the doffer, is taken up by and wound upon a drum or cylinder of the bat forming machine.—Patent completed.

2478 W. E. Næwton, Chancery-lane. Firearms. Dated

upon a drum or cylinder of the bat forming machine.—Patent completed.

2478 W. E. NEWTON, Chancery-lane. Fivearms. Dated August 7, 1868.

This consists, first, in the combination of a tubular magazine for containing a series of charges, with a sliding barrel which is closed when drawn back in contact with the recoil shield to enclose a cartridge, and which is open to receive a cartridge when pushed forward from the recoil shield. Second, mechanism for elevating cartridges one by one from the magazine up to the line of the barrel in combination with the sliding barrel by which such mechanism is operated. Third, an arrangement of mechanism for cocking the hammer by the sliding forward of the barrel. Fourth, of a spring for drawing the barrel forward from the recoil shield, in combination with catches for locking the barrel when the rear breech is drawn back in contact with the recoil shield. Fifth, an arrangement of mechanism for holding the cartridge in line with the barrel while the barrel is being drawn back to enclose it and the lifter is being depressed. Sixth, a means for preventing the trigger from being drawn back to fire the charge unless the barrel is in the right position and locked. —Patent completed.

2479 J. Arnoll, Sheffield. Steam boilers. Dated

—Patent completed.

2479 J. Arnold, Sheffield. Steam boilers. Dated August 7, 1868.

This consists principally in inserting a hemispherical dish-shaped auxiliary water space in the firebox, and in connecting it to the top of the firebox by means of tubes, by rivets or otherwise, so that a free circulation of water is established between it and the water space above.—Patent abandoned.

2480 L. GARDNER, Neath. Annealing pots. Dated August 8, 1868.
This consists in the construction and employment of annealing pots and stands of a corrugated form.—Patent completed.

completed.

2481 J. Broadfoot, Glasgow. Water-closets. Dated August 8, 1868.

This apparatus comprises a main discharge valve of a spherical form, with a cylindrical way through it, and which is held in a spherically-shaped box made in two halves. The valve is made with a shell of gun metal, in which a tube of copper is soldered, to form the way through it. The shell is cast with spindles or journals on it, and apertures in the box through which these pass are kept tight by stuffing boxes. One of the spindles has fixed on it a curved slotted crank, arm, or lever, acted on by a pin with a roller fixed to a lever, that has the usual hand rod attached.—Patent completed.

2489 B. Hunt Lincoln's Inn. Blind furniture. Dated

2482 B. HUNT, Lincoln's Inn. Blind furniture. Dated

August 8, 1868.

This apparatus consists principally of a grooved pulley fixed on one end of the roller, and having a hollow projecting centre or box, in which is placed a spiral or coiled spring. The inner end of this coiled spring is attached to the centre of the pulley, and the outer end thereof is attached to the plate or bracket which carries the fixed pin or pivot on which the pulley is mounted and turns. Two small grooved pulleys, placed a small distance apart, are attached to the bracket below the roller pulley, and serve to guide and facilitate the working of the endless cord.—Patent abandoned.

2483 J.Kirk, Woolwich. Fortifications. Dated August 8, 1868.
The shield is divided into a convenient number of cells or chambers, so constructed and arranged that they can be readily filled or charged with water, in order to offer increased resistance to projectiles.—Patent completed.



2484 J. STANDEN, Borough. Multitubular boilers. Dated August 8. 1868.

The object of this invention is to counterbalance the pressure on the tube plates of multitubular boilers. The patentee forms the centre part of the top of the boiler (supposing it to be an upright boiler) with a head or dome of a cylindrical shape. The dome is not fixed to the flat top, but passes through a large hole or opening formed therein, and is so formed as to receive packing which surrounds and encircles the dome, and allows it to have free play through the fixed top as expansion and contraction goes on.—Patent abandoned.

2485 A. V. NEWTON, Chancery-lane. Steam engine governor. Dated August 8, 1868.

This apparatus consists of a receiver fitted with a movable cover or elastic diaphragm, to which is connected a crutch, jointed to a throttle valve lever. The receiver is also provided with an outlet, having an adjustable valve applied to it for regulating the escape of fluid that is forced into the receiver by a supply pump worked by the engine to be regulated. The supply pump is double acting, and its object is to supply fluid (through branch pipes fitted with floating valves) to the reservoir, in such quantity as to keep the cover or diaphragm, and thereby the throttle valve of the engine at a position for controlling the speed of the engine, a regulated escape for the fluid from the receiver being at the same time kept open. By this arrangement, should the speed of the engine exceed or fell short of the prescribed limit, the fluid will be forced into the receiver faster in the one case and slower in the other than it escapes, by which means the cover of the receiver is caused to operate upon the throttle valve, and open or close this valve more or less.—Patent abandoned.

2486 W. E. Newton, Chancery-lane. Screws and screw direers. Dated August 8, 1868.

abandoned.

2486 W. E. NEWTON, Chancery-lane. Screws and screw drivers. Dated August 8, 1868.

This consists in providing the screw head with two or more triangular notches extending through it, and slightly dovetailed, whereby it is adapted to be grasped and held firmly by two or more gripping jaws inserted in sockets in the end of a stock or tool. The ends of the jaws which thus operate are bevelled so as to form cutters which roam away the wood, and prepare a countersink under the head of the screw, as the heaf approaches the surface of the wood with which, when the screw is fully inserted, its head lies flush.—Patent completed.

2487 D. NICKOLS, Manchester. Taps. Dated August 8,

2437 D. NICKOLS, Manchester. 20ps. Dated August 8, 1868.
This consists in arranging and combining with the cone plug mechanism by which it can only be slowly rotated, namely, a worm wheel upon the axis of the plug gearing into a worm, on a short shaft formed with a handle.—Patent abandoned.

2488 H. Dubs, Glasgow. Steam crane. Dated August 8.

1888.

This consists in the construction and use of a new or improved "crane locomotive," or a locomotive steam engine and self-acting or steam jib crane combined. The patentee claims, first, the construction and arrangement of the parts generally of a steam crane and locomotive engine combined. Second, the construction and arrangement of the parts generally for actuating the supply steam valve and link motion of the engines of the crane through its axial pillar in combined steam crane and locomotive engines.—Patent completed.

2489 E. William S. Staines Resignate extent.

engines.—Patent completed.

2489 F. Walton, Staines. Resinous cement. Dated August 8, 1868.

The patentee puts into an open pan, heated by high pressure steam or fire, 160lb. of kourie or New Zealand gum; when this is fused, he adds 80lb. of castor oil; the heat is continued with constant stirring until the two substances become intimately combined, which may be known by the liquidity of the combination. This material is suitable for cementing substances together, such as wood or stone, or caulking seams of vessels or tanks.—Patent completed.

2490 J. HIRD, Bristol. Motive power. Dated August 8

1868. The patentee connects the flywheel of the first motor to a shaft containing a pulley keyed thereto, from which a driving band extends to a second shaft carrying a pulley and flywheel, the diameter of which, and the consequent weight, are much greater than the first, and from this second series he again operates a third series, the flywheel of which is proportionally increased in size and weight.—Patent abandoned.

2491 T. KENYON, Manchester. Sulphuric acid. Dated August 10, 1868.

The patentee takes nitrous and sulphurous gases and forces them through a solution of weak sulphuric acid; as the gases rise therefrom, they are met by a spray of weak sulphuric acid combined with air and high pressure steam.—Patent abandoned.

steam.—Fatent abandoned.

2492 F. LE ROY, Commercial-road. Non-conducting compound. Dated August 10, 1868.

This composition is intended to be used as a substitute for mortar and cement in building or stopping up boilers. The patentee takes lewt. of brick clay, 70lb. of powdered charcoal, 28lb. of sawdust, 28lb. of fuel sweepings, 8lb. of cow hair, 8lb. of cocoa nut fibre, 2lb. of flour, yeast, or other formentable substance, 8lb. of the residues from the conversion of starch into sugar, 80lb. of water, and 36lb. of cotton foot oil. The above ingredients are placed in a vessel containing a stirring apparatus, which is set in motion, and as soon as the substances are well mixed and combined into a paste or mortar, it is changed into a fermenting vat and submitted to such a heat as to cause the fermentation, by which a homogeneous self-adhesive substance is formed.—Patent completed.

2493 T. CORFIELD, Falmouth. Paper bags. Dated August 10, 1868.

The patentee takes a narrow slip of tin which he fastens by paste or otherwise along one side of the mouth of a bag with the ends extending a little way on either side. The mouth is then bent to keep the bag open whilst being filled, and when so filled the mouth is again straightoned and folded over several times; the ends of the slip of tin are then bent back so as to secure the mouth of the bag.—Patent abandoned.

2494 B. Hunt, Lincoln's Inn. Eyelet machine. Dated August 10, 1868.
This consists in the employment of a series of annular recesses formed on the surface of a rotating cylinder, in which recesses are fitted sliding tubes that surround fixed cylindrical pins, thus forming circular spaces for the

reception of molten metal properly conducted to the same. A reciprocating longitudinal motion is given to the sliding tubes by means of crossbars to which they are attached.—Patent abandoned.

2495 B. HELLWAG, Greenock. Ship telegraphs. Dated

2495 B. HELLWAG, Greenock. Ship telegraphs. Dated August 10, 1868.

This consists in the employment of tubes filled wi h liquid which is acted upon by pressure from a cylinder. Piston rods are connected to index hands both above and below the deck. The movement of the index hand is governed by the amount of pressure exerted on the fluid.

—Patent abandoned.

2496 W. W. HUGHES, Porchester-terrace. Forcing air.

2498 W. W. Hughes, Porchester-terrace. Forcing air. Dated August 10, 1868.

The patentee makes a turbine or fan with two discs, one solid or close, the other open in the centre to admit the air. A ring is fixed round the outside of this opening to the disc, and revolves airtight in the front end of the casing. The spindle or shaft is fixed in the centre of the solid disc, and passes through the opening in the other end of the turbine or fan, without being attached to it, to an apright on which this end of the spindle which carries the pulley turns.—Patent abandoned.

2407 A V Newyon, Changaralang Stagm bolight. Dated

pulley turns.—Patent abandoned.
2497 A. V. NEWTON, Chancery-lane. Steam botters. Dated
August 10, 1868.
This consists in fitting a water tube outside the boiler.
The tube contains two floats, connected to a double lever;
when the water gets below a fixed level, one of the levers
opens a valve to which the whistle is connected.—Patent
completed

when the water gets below a fixed level, one of the levers opens a valve to which the whistle is connected—Patent completed

2498 D. Fauwinth, Norwood. Printing surfaces. Dated Angust 10, 1868.

The object of this is the production of metallic surfaces in relief, suitable for surface printing, in an ordinary printing press, by the combined use of photography with a process somewhat resembling in its main features the known glyphographic process, for the production from engraved plates of other plates or blocks with the design in relief. The patentee first produces, by any of the known photographic processes, a negative on glass, or any transparent substance. The success of the printing process depends mainly upon the negatives, and every means must be taken to render them as intense and as black as possible. The negative must be capable of giving positive impressions, by transmitting chemical rays of light, in the well known manner. With this negative, a reversed image is produced on a copper or any other metal plate, glass, or ebonite paper, or flexible substance, according to the work it is required to produce. To render the surface sensitive, and suitable to receive the photographic image, a paste is made, composed of bichromate of potash and a salt of soda or ammonia pulverized, and mixed with a solution of gum or organic substance, which is not soluble in alcoholic mixtres. This paste is mixed in one ounce of bichromate of potash, half an ounce of hyposulphite of sods, and half an ounce of hydrochlorate of ammonia, commonly called sal ammoniac. These ingredients are pulverized, and dissolved by means of gentle heat, in loz. of sibumen, 2 oz. of gelatine, and 2 oz. of Relatine, and 2 oz. of Novemberger glue, or best French transparent glue, dissolved in from two to three pints of water. This paste is spread evenly over the metal or glass plate, and artificially or spontaneously dried. The plate thus prepared is then to be brought in contact with the negative, in an ordinary photographic printing frame, and

Impression, which is capable of being transformed into a surface in relief. —Patent completed.

2499 R. Robinson, Preston. Regulating speed. Dated August 11, 1868.

The patentee provides two shafts, which, for distinction, may be called first and second motion shafts; these shafts are placed at suitable distances, in parallel line with each other; upon each of these shafts is fixed a band pulley, in each half of which a key passes, and is recurely fastened thereto; through one half is passed a right, and through the other a left-hand screw; these are passed up the centre to the outer end of each shaft, and secured at the end by collar and plate, free to revolve, and long enough to admit of change wheels where required. On the end journal of each shaft is fitted a tooth or worm wheel, free to revolve; this wheel may be made round on the rim for convenience of turning by hand if required. A band is placed on the expanders of both the first motion shaft while closed, and over the second motion shaft will be increased in velocity; then by gearing the second motion shaft will be increased in velocity; then by gearing the second motion shaft with any machinery, any necessary variation of speed may be obtained in proportion to the runge or sizes of the expanders.—Patent abandoned.

2500 W. H. Hunt, Liverpool. Baskets. Dated August 11,

2500 W. H. HUNT, Liverpool. Baskets. Dated August 11

This consists, first, in carrying the arched hoop, which forms the handle, down outside the mouth frame of the basket, instead of inside. By this construction, an increased internal space is obtained. Second, in making the covers of two pieces, and hinging or jointing them to the two longest sides, in order that the covers may be opened to the full size of the mouth of the basket.—Patent abandoned.

the full size of the mouth of the basket.—rarent acandoned.

2501 J. Brown, S. Stockton. Rolling iron. Dated August 11, 1868.

This consists in arranging two series of rolls one in advance of the other. The rotation of each series is in advance of the other. The rotation of each series is in a direction opposite to that of the adjacent series. Thus, when each series consists of four rolls, they are arranged in the following manner.—The first pair of rolls rotate in a direction proper to take the bloom, or slab, or pile from the workman, and, after having passed through the rolls, to deliver it into a second pair immediately in front of the first pair having rotation in the same direction, but driven at a higher or greater speed than the first pair. The bloom or slab is then returned through a third pair of rolls, the axes of which are in a line with the axes of the second pair, but which third pair rotates in a direction opposite to that in which the first and second pairs rotate. The bloom, pile, or slab is delivered by the third pair of rolls to a fourth pair, whose axes are in line with the first pair, and which rotates in a direction similar to that of the third pair. The slab, pile, or bloom, having been passed through four pairs of rolls, is delivered back to the workman at that side of the system of rolls at which it was introduced.—Patent completed.

2502 A. M. CLARK, Chancery-lane. Propelling vessels.

Dated August 11, 1868.

The patentee proposes to inject steam at a high pressure, from a suitable boiler, through an apparatus composed of several cones—to which the water has free access—disposed one within the other at the bottom of a vessel, which steam carries with it a column of water of sufficient diameter to produce, by its reaction on the surrounding water, sufficient power to propel the vessel.—Patent completed.

2503 I SALMON Manchester. Printing mechings. Dated

2503 J. SALMON, Manchester. Printing machinery. Dated

pleted.

2503 J. SALMON, Manchester. Printing machinery. Dated August 11, 1868.

This consists in an improved arrangement and combination of mechanism by which the cards are set in position for printing, printed, and delivered from the machine; and also the type inked and the inking roller fed with fresh supplies of ink; all these operations being performed self-acting. The cards are laid in a pile one above another on a table. Underneath the pile a small feeder is caused to move to and fro, at each forward movement taking a card from underneath the pile, and delivering it over the place where it is printed. As the feeder recedes after delivering the card, the former rises and prints the card. When the card has been printed, it is forced out by the following card being pushed in, and falls into a shoot consisting of adjustable inclined planes set in such a manner as to turn the card over and cause it to fall with the printed side uppermost. As the printed card passes off, the inking roller is caused to pass over the forme, giving it the necessary supply of ink for the next impression, and, continuing its motion, comes in contact with a disc, from which it takes up a freeth supply of ink, the disc being caused to change its position each time the roller passes across it, so as to present a fresh surface to the roller at each stroke.

—Patent completed.

2504 H., T. and G. Moors, Birmingham. Cornices, pele, the card angust 11 1868.

-Patent completed. 2504 H., T. and G. Moore, Birmingham. Cornices, poles, c. Dated August 11, 1868. Cornices are made with tablets or panels of glazed are cemented to a wood back. Poles and rods are made f earthenware (tubular or solid).—Patent abandoned.

of earthenware (tubular or solid).—Patent abandoned.

2505 M. Gray and F. Hawkins, Woolwich. Tetegraph
wires. Dated August 11, 1868.

The wires are covered with a secondary, or it may be a
primary, insulating coat of plastic compound by employing pairs of pressing or squeezing rollers, formed with
several half-round ring grooves placed side by side, and
having as projections that separate the grooves blunt
edges or compressing rings. Between these rollers are
passed a number of wires—to be coated—corresponding
with the number of grooves provided in the rollers; and
with the wires are passed in two ribbons or fillets of the
compound india-rubber, one above and the other below
the wires, such ribbons being of a width suitable for
covering all the wires or enclosing them in rubber. By
the action of these rollers, the rubber is pressed upon and
around the wires, and caused effectually to coat the same
without waste.—Patent completed.

2506 J. H. Johnson, Lincoln's Inn. Permanent way.

without waste.—Patent completed.

2506 J. H. JOHNSON, Lincoln's Inn. Permanni way.
Dated August 11, 1868.
This consists of a new form of rail which is provided
with a safety flange to prevent the wheels running off the
line. Upon this new rail is applied a sheathing composed
of steel plate, over which the rolling stock runs, and
beneath the sheathing there is disposed a pad or cushion,
the object of which is to deaden and neutralize the shocks
to which it is subjected. The rails thus composed of two
principal parts, and forming the movable part of the permanent way, are supported on wrought-iron arches, castiron chairs, and sleepers connected together.—Patent completed.

pleted.

2507 A. ARGAMAKOFF, Stockwell Green. Printing in relief. Dated August 11, 1868.

This consists of the following ten operations:—1. Covering plate glass with a layer of gelatine. 2. Drying the gelatine layer. 3. Preparing the gelatine layer, £e., making it sensitive to light, and incapable of dissolving when the gutta-percha is poured on it. 4. Exposing it to the light under a photographic negative or positive taken on thin paper. 5. Revealing the drawing by means of a moist surface (glue or gelatine). 6. Impressing the drawing on gutta-percha. 7. Increasing the relief of the gutta-percha plate by hand. 8. Obtaining the copper matrix. 9. Obtaining the copper plate or printing surface in relief (cliche). 10. Increasing the relief of the copper plate or the cliche by corroding the ground.—Patent completed.

2508 J. MFARLANE, Edinburgh. Papermaking maching.

2508 J. M'FABLANE, Edinburgh. Papermaking machines Dated August 11, 1868.

Dated August 11, 1868.

This consists in constructing the upper and under couch rollers with an iron shell covered with vulcanite and india-rubber of suitable thickness, the vulcanite being fixed upon the iron shell, and a covering of vulcanized india-rubber fixed upon or over the vulcanite, by which means a perfect junction is secured—Patent completed.

2509 This invention is under opposition, therefore the documents cannot be seen.

documents cannot be seen.

2510 E. P. G. HEADLY, Cambridge. Watering roads.
Dated August 12, 1868.
Upon a suitable locomotive frame, to be propelled by
hand or otherwise, the patentee mounts a windlass or
drum, the axis of which is hollow. Upon this drum any
required length of flexible tube or pipe is wound, one end
of which is connected with the hollow axis of the drum
upon which it is wound; the free end of the tube is litted
with connections for attaching it to hydrants or standards
supplying water under pressure. To the hollow axis of
the drum suitable distributing media are attached. The
axis is litted with a handle for winding the pipe, which
runs off as the frame is moved on again when required.
—Patent completed. Patent completed.

—Patent completed.

2511 D. HILL, J. RICHARDSON, G. N. DUCK, C. E. JOHNSON, and W. F. MASTERMAN, Stockton on-Tecs. how and steel. Dated August 12, 1868.

This consists in the use of srtificial compositions in the refining of iron and steel. One class of composition is formed by taking any natural iron ores, or iron stones, or ferruginous bodies, comparatively free from phosphorus and sulphur and their oxides and compounds, and melting the same, either singly or in combination. Class two is prepared by taking one or more of the substances previously mentioned as entering into Class one, and melting the same, either singly or in combination, together with scrap iron, for the purpose, into a mass which is more or less homogeneous. Class three is formed as follows:—Any natural iron ores, iron stones, or artificially obtained forruginous bodies, having been melted and prepared as before described, with reference to Classes one and two.



with or without the addition of scrap iron and siliceous matter, a compound is formed therewith as follows: One or more of the heavy metals, such, for instance, as lead or manganese, or any alloy, amalgam, oxide, or salt of such metals, alkalies, or alkaline salts, or any hallod body, or any mineral or minerals, or artificial body ar bodies, or organic substances, containing the same or one or more of them, or the waste products from stills, in which chloriue has been prepared, are charged along with one or other of the ferruginous compounds before described, into any suitable furnace, vessel, or apparatu and the whole melted together into a mass which is more less bonogeneous. After being sufficiently heated they are removed in any convenient manner from the furnace, vessel, or apparatus employed, and while still in a bot state, or after being cooled, charged with pig iron in the refinery, or with refined plate or pig iron in the puddling furnace, or in any furnace, vessel, or apparatus in which the manufacture of iron or steel is conducted, the result in either case being that the iron or steel is more or less purified, and the qualities of the same improved in a very high degree.—Patent completed.

2512 J. WINSBORROW, Dalston. Motive power. Dated

August 12, 1868.
For this purpose pistons work perpendicularly in cylinders open at each end into separate chambers, which are supplied through passages and slide valves operated from a rotary axis, having motion given to it by bevelled from a rotary axis, having motion given to it by bevelled for other suitable gear connected to the piston rods. Gearing communicates motion to the index wheel work for registering the motions of the pistons, and consequently the amount of liquid measured. By these means, the use of stuffing boxes to the piston rods is rendered nunccessary, and the friction and wear consequent thereon is avoided. The liquid to be measured passes into the valve chamber, and thence through the alternate ports of the valves to the respective ends of the cylinders. The outlet for the measured liquid is through the valve chamber and by a central port.—Patent completed.

2513 J. S. PENDLEBURY, Bury, Steam pumps. Dated August 12, 1868. For this pu

2513 J. S. PENDLEBURY, Bury. Steam pumps. Dated

2513 J. S. PENDLEBURY, Bury. Steam pumps. Dated August 12, 1868.

Upon the sides of the valve spindle are formed inclined planes in opposite directions upon which springs act, small friction rollers being interposed. The effect of these inclined planes and springs is, that the spindle must move in either one or other direction to the end of its stroke, and cannot stop at any intermediate positi n. A lever actuated by an arm on the piston rod imparis motion to the valve spindle until the apex or the junction of the inclined planes is pushed just beyond the point where the spring acts, and the spring then completes the stroke.—Patent abandoned.

2514 J. THOMPSON, Handsworth. Utilizing iron. Dated

2514 J. THOMPSON, Handsworth. Utilizing iron. Dated August 12, 1868.

The object is the utilization of ends or heavy scraps cut from the ends of rails. These scrap ends usually average from lft. to 15in. long, more or less. These are treated by rolling in the mass.

The lump is first heated and passed between rolls, which has the effect of dividing the mass into as many divisional parts as may be suitable; by subsequent working and reduction they are reduced down to desired sizes for rolling.—Patent abandoned.

2515 J BROAD, London Bridge. Treating fibres. Dated

2515 J Broad, London Bridge. Treating fibres. Dated August 12, 1868.
This consists in constructing cast-iron cylinders hollow to admits steam therein; on the external part are steel pins, so that when the cylinders are put in motion the fibrous material is acted on by them; the steel pins on are made with a cutting edge, or they may be pointed, so as to have the effect of dividing or separating the fibrous material. either animal, vegetable, or mineral, into a pulp, is a vessel made sufficiently strong to admit of steam being introduced therein for the purpose of acting on the fibrous material is submitted to the action of caustic soda, wood ash, and blue lias lime concentrated with spirits of salts.—Patent abandoned.

Patent abandoned.

2516 H. H. Henson, Westminster. Metallic ropes, Dated August 12, 1868.

This consists in employing the wire or wires for such ropes in their natural ungalvanized and consequently unwakened state, and providing them either before or during the process of rope making with a protective coating of tape, jute, hemp, or fabric, and a preparation of "Hay's glue," carbonized oil, or some other suitable bituminous or other material or compound that will effectually exclude moisture and grit.—Patent completed.

2517 C. D. J. SEITZ, Lancaster, Furnace. Dated August 12, 1863.

The patentee mixes a small quantity (say, about 25 per cent, to the soda contained in the lyes) of quicklime, with the waste lyes, which makes the residuum open and pomus, and thus allows sufficient atmospheric air to come into contact with all parts of it, and to freely burn off the resinous and gummy matters.—Patent abandoned.

2518 J. WILSON, Salford. Blinds, sun shades, &c. Dated August 12, 1869.
This consists in the adaptation and employment of expanding and contracting arms, similar to lazy longs, for moving blinds out and in, and making them self-supporting without the use of stays or pillars.—Patent completed.

2519 R. H. SOUTHALL and W. HALLAM, Manchester, Boots and thoss. Dated August 12, 1868.
Guards for side springs are formed of soft leather; each guard is made in two parts, or in one piece folded and tightly stitched to the side of the leather forming the upper of the boot.—Patent completed.

upper of the cook.—Fatent completed.

2520 H. J. W. and R. DEWHURST, Huddersfield.

Ornamenting seal skins. Dated August 12, 1863.

This relates to the production of painted seal skin cloths
of any width by mechanical means.—Patent completed.

2521 LUNN, Horncastle. H Envelopes. Dated

2521 H. LUNN, Horncastle. Envelopes. Dated August 12, 1868.

The bag is closed along three sides, and is provided with a closing flap on the fourth side, which flap has a tongue formed thereon or secured thereto, having an enlarged extremity. A slip of cardboard, or other stout material, is let into or secured upon the body of the bag or envelope, and the expanded end of the tongue is passed through or under it, the expanded portion of the tongue having been first folded down at the sides so as to enable

it to pass through or under the slip and then opened out again so as to effectually retain the tongue in its place and keep the flap closed.—Patent abandoned.

2522 J. CLEAVER, Nottingham. Metal covered lace, Dated August 12, 1868.

The surface of the bobbin net or other fabric is dressed with a strongly adhesive material upon which small pleces of sheet metal are sprinkled, and to which they adhere as they fall.—Patent abandoned.

adhere as they fall.—Patent abandoued.

2522 R. C. RAPIER, Westminster. Electric clocks.

Dated August 12, 1863.

wo or more breaks are employed for the purpose of making simultaneous contact, the object being to secure certainty of action. In order to hang a pendulum, a bar of steel or other metal, with one edge turned up, is supported on a frame. The pendulum stem does not reach quite up to this bar, but is suspended on it by two cheeks or plates fastened to the sides of the stem of the pendulum. This bar is fitted with a stud or pin midway between the checks, and on this pin turns a friction roller which offers far less resistance to the working of the pendulum than any kind of dead collar would do.—Patent abandoned.

doned.

2524 H. B. WALKER, Bradford. Extracting burns from wool. Dated August 12, 1868.

The patentee first steeps the wool in a bath of sulphuric acid and water which varies in strength according to the class of wool under treatment. The wool is then passed through rollers (by preference fluted) to crush the burns and squeeze out the acid and water. It is then spread for a short time on the floor to cool, and to allow the air to act on it; it is then dried upon steam pipes or other means. When perfectly dry, it is "willyed," to knock out the burns.—Patent abandoned.

2535 W. PANNE Bellem. Steam cocks. Dated.

when perfectly dry, it is "willyed," to knock out the burrs.

—Patent abandoned.

2525 W. PAYNE, Balham. Steam cocks. Dated August 12, 1868.

The barrel of the cock is provided with a branch finlet pipe communicating with the upper chamber; this chamber is formed with an open top, within which a screw thread is cut to receive a screw plug. A coulcal seat is cut in the chamber as abort distance below the inlet for the reception of a valve, the diameter of which is less than that of the chamber, so as to leave an annular space between the two, and the upper surface of the valve is provided with a guiding stem extending into a corresponding cavity or recess cut in the screw plug or cap of the chamber, in order that the valve may be enabled to rise and fall within the chamber, the faces of the valve always maintaining the same plane. The lower surface of the valve is extended by a shoulder and terminated by a projection in line with the stem, reaching nearly to the centre of the bore for the plug. The plug is then formed tapering cylindrically at each end, but midway where it intersects the chamber a segment is cut away on each side of the cylinder, thus leaving corresponding openings or spaces when the plug is turned down by the handle to close the chamber, but when the handle is turned back the two remaining arcs of the plug fit the lateral portion of the bore i; in this closed position of the cock, the lower extremity of the valve descends into the space left in the plug by the removal of the segment, and the valve becomes securely seated; but when the plug is opened, the arc of the plug assumes a position transversely to the chamber, and rising upwards by its rotation, elevates the valve from its seat and permits the flow of steam.—Patent completed.

2526 G. A. BUCHHOLZ, Shepherd's Bush. Hulling grain.

and rising upwards by its rotation, elevates the varie from its seat and permits the flow of steam.—Patent completed.

2526 G. A. Buchholz, Shepherd's Bush. Hulling grain. Dated August 12, 1868

The bulling machine consists of a cylindrical case fitted at its opposite sides with panels of wire gauze or pierced metal to facilitate ventilation within, and armed on its inner periphery at the parts not occupied by the panels with sets of steel blades fixed radially in segmental groups. Within the cylindrical case is mounted a series of drums, which are keyed upon a central rotating shaft. These drums are armed on their peripheries with blades made like those on the case of the flat steel plates. The drums are cast with radial wings extending from the boss to the periphery, and holes are formed through the drums to allow of a down draft being created and distributed through the case by the wings as the drums are rotated. The drums, instead of being enclosed, as heretofore, in separate cylindrical chambers, have interposed between them horizontal rebated ring plates, which form part of the case. The ring plates, and also the bottom plate of the case, are cast with annular flanged projections, which are intended to receive steel blates rebated at the tack to fit the flanged projections.—Patent completed.

2527 J. Petrie, Rochdale. Washing tool. Dated

2527 J. Petrie, Rochdele. Washing wool. Dated August 12, 1868.

A rake is euclosed in a washing vessel, and is mounted upon a ball or other joint carried by a lever or levers, an arm of which turns upon a centre and carries a balance weight. The vibratory motion is imparted to the take by a crank.—Patent abandoned.

a crank.—Patent abandoned.

2528 W. E. NEWTON, Chancery-lane. Photographic frames. Dated August 12, 1863.
This consists, first. in making a card, or card frame, of paper or other material, having an opening through it for exhibition of the picture, and framed with an embossed border round the opening. The card or frame is produced simultaneously by cutting and punching the paper in a press. The invention further consists in a combination with automatic feeding devices for feeding a continuous strip of paper under the cutters and punches in regular succession. The paper is fed by a pair of rollers unler a tamping press, the head of which has an up-and-down notion imparted to it by means of a cam working in a rectangular slot in the crosshead.—Patent completed.

2529 R. Sim Nanles. Preserving shins bettom.

2529 R. SIM. Naples. Preserving ships bottoms. Dated August 1?, 1868.
This consists in employing a mixture of iodine and red iodine of mercury made into a paste or composition.—Patent completed.

2530 F. BARNETT, Paris. Swimming apparatus. Dated

2530 F. BARNETT, Paris. Swimming apparatus. Dated August 13, 1868.

The patentee purposes to use what he calls "human tins," having the properties of fishes fins, and at the same time answering the purposes of the feet of aquatic birds. The hands of a swimmer are titted with extensive membranes, which are both firm and supple and rigid, in one sense. These membranes are composed of india rubber, or any other substance, of such a thickness as to permit them to be perfectly pliable between the fingers when desirable to close them and the thumb against each other.—Patent completed.

2531 W. THOROLD, Norwich. Railways, Dated August 13,

1863. One single line of rail is arranged in the middle of the roadway. The rolling stock is constructed with four bearing wheels, with double flanges, all in one line in the middle, underneath each carriage or truck, instead of having bearing wheels placed on each side. Traversing screws and gear are employed for shifting the wheels laterally relatively to the body of the carriage or truck, until the load is perfectly balanced upon the wheels. The perpendicular position is preserved by the addition of one or more wheels on each side of the carriage or truck, so arranged, by working in slots, to run freely cut the road, without bearing any part of the weight of the carriage or truck, except when the carriage or truck inclines to one side or the other.—Patent abandoned.

2532 R. SAUNDERS, Croydon, Anchors. Dated August 13.

2632 K. SAUNDERS, Croydon. Ancore. Dated August 18, 1868.

The shank is made in two parts, that next the crown end of a bar of iron, with a slot in one end, and a large orifice at the other. This orifice is circular at the top, and gradually tapers towards the bottom, where the arms enter, and work freely upon the inner rim of the collar, thereby obviating of jectional friction in the orifice. The cable end of the shank is composed of rubber or other elastic discs and washers of iron, alternately arranged in a metal frame, with a drawbar passing through their centre, and these are securely held in uniform position by a strong nut or other reliable fastening on the end of the drawbar bearing on the top of a strong travelling plate. By means of this elastic part of the shank, all sudden jerks are mitigated when bringing up or riding at or weighing anchors.—Patent completed.

2533 J. Grant. Hamostead. Music stands. Dute1

anchors.—Patent completed.

2533 J. Grant, Hampstead. Music stands. Dated August 13, 1863.

The patentee forms a right-handed screw upon a straight spindle; the screw has as many turns as may be convenient of a very deep thread, the spaces between each turn of the thread and the next being intended to receive one of the leaves required to be turned over, so that the number of leaves with which the screw can be charged at the next three leaves thread the depend upon the number of number of leaves with which the screw can be charged at one time must necessarily depend upon the number of such spaces. A short projection or thumb is connected to the spindle, and projecting outwards from it. As the spindle is turned by a rod and treadle worked by the foot, the projection moves up between the leaves, and by continuing motion, a leaf is turned over from one side to the other.—Patent completed.

the other.—Patent completed.

2534 J. M. MILLBANK, Connecticut, U.S.A. Firearms and cartridges. Dated August 18, 1868.

To the side of charging chamber, a lever is fitted. A toothed quadrant in connection with the lever draws back the striker, which is held in that position by the trigger, as usual. The cartridge case is fitted with a flanged base, acp is placed in the centre, an indent is made in the cap for the fulminate to lodge in the crease. The powder is free to enter the cap, and the certainty of ignition is ensured by the base of the cap being smashed up.—Patent completed.

2535 B. INGHAM, Bradford. Dyeing warps. Dated August 13, 1861.

This consists of a rectangular box or vessel to contain the dye liquor, having a roller at each end out of the vessel to wind the fabric on and off, from one to the other. The box is also fitted with one or more other rollers, to conduct the fabric through the dye liquor.—Patent abandoned.

doned.

2536 H. STEFFANSON and J. HADLEY, Upper Thamesstreet. Decorticating grain. Dated August 13, 1868.

This consists of a series of roughened rotating arms or blades, mounted on a central shaft or spindle, in a cylinder, to which the grain to be operated upon is admitted, by preference, in a continuous stream, and from which it is discharged, after having been sufficiently long exposed to the decorticating action of the roughened blades.—Patent completed.

2537 J. HOLDING, Lancaster. Healds. Dated August 13

1866.
This consists in making healds of two distinct substances or materials, such as metal, for the top portion, that is from the eye upwards, so as to embrace the top heald stave and fibrous material, downwards, so as to embrace the bottom heald stave.—Patent abandoned.

2538 S. C. LISTER, York. Combing wool. Dated August 18,

1868.

The teeth of the cards that first act upon the fibre are longer and coarser than those on the finishing side; the teeth are made with round wire. Combs are employed in place of cards. The combs are made coarse at one end and finer at the other. They are mounted on an endless chain; each comb travels in a groove their motion can be controlled, and made to enter the wool at right angles to the nip, and draw through the wool or fibre nearly horizontally.—Patent abandoned.

201tally.—Fatest abstractioned.

2539 S. R. CRAMPTON, Westminster. Grinding coal.

Dated August 13, 1868.

This consists in grinding coal, by means of ordinary mill stones, in combination with an artificial current or blast of air, between the grinding surfaces, produced either by a blast or by a powerful exhaust, acting as an inverted blast.—Patent completed.

2540 H. K. YORK, Cardiff. Treating iron. Dated August 13, 1861.

According to this invention, the parentee reduces metal by means of teeth, formed of short pieces of bur steel or iron, which are held at the ends in two discs mounted on an axis. The iron or metal to be reduced is prescuted (usually when hot) to the teeth, by introducin it between two discs, in a radial direction; the metal is no steel it of a guide through, and is pressed forward towards the centre of the discs, so as to cause it to bear against the teeth, by a plunger, actuated by a hand lever, or tongs may be used to carry the metal forward.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT.

Dated February 23, 1869. 557 J. T. Gaze and J. Hymas, Erith. Improvements in 1558 A. Johson, Darlington. Improvements in the ma



chinery or apparatus for discharging, and in the arrangement and construction of coke ovens, also in the mode ment and construction of coke ovens, also in the mode of utilizing the waste heat of coke ovens. 559 J. Breeden, Birmingham. Improvements in taps

or stop-cocks.

560 J. Johnson and W. Gill, Unstone, Derbyshire. Im-

560 J. Johnson and W. Gill, Unstone, Derbyshire. Improvements in rotary engines and pumps.
561 B. W. Farey, Bermondsey. Improvements in the seatings or facings of gas valves.
562 W. F. C. Mourie, Southampton-row, Middlesex. Improvements in pianofortes.
563 J. Neilson and J. Marshall, Glasgow. Improvements in applying trade marks, names, and devices upon metallic capsules.

mental capsules.

564 A. V. Newton, Chancery-lane. Improvements in the tire-boxes and ash-pans of locomotive engines.

565 S. Holroyd, Newton Heath, Manchester. Improvements in the recovery of substances used in the purification of gas for illumination, and of waste products arising therefrom.

therefrom.

566 H. Bessemer, Queen Street-place, Cannon-street,
City. Improvements in the construction and arrangement of machinery, apparatus, and buildings employed
n or for the manufacture or production of east steel and
malleable iron from pig or other carburet of iron.

malleable iron from pig or other carburet of iron.

Dated February 24, 1869.
567 W. E. Gedge, Wellington-street, Strand. An improved hand vice.
568 J. J. Myers, Caxton Iron Works, Spa-road, Southampton. A novel method of enabling passengers to warn railway servants in charge and during the running of a train of anything dangerous to their lives and welfare, and to indicate to the guard promptly the carriage and compartment from which such warning shall have been caused, also to enable the driver to know immediately if any pertion of his train of carriages has broken away or been disconnected from any cause.
569 J. Whitehead, Middleton-road, Oldham. Improvements in furnaces for steam boilers and other purposes.
570 W. A. Ives, New Haven, Connecticut, U.S.A. Improvements in mechanism for making circular tenoms and mortises.
571 W. Williams, Mitford-street, Liverpool. Improvements in laying and joining pipes for cother like purposes.

provements in mechanism to and mortises.

571 W. Williams, Mitford-street, Liverpool. Improvements in laying and joining pipes for gas, water, and other like purposes.

572 J. Cooke and G. Hibbert, Richmond, Yorkshire. The use of one or more steam jets with or without water for obtaining vacuum power, applicable to steam and other motive engines, also to other purposes in paper, chemical, iron, steel, and other works and inaunfactures.

573 B. Hunt, Serle-street, Lincoln's Inn. Improved apparatus for regulating friction on the bobbins of machines used for spinning cotton and other fibrous materials.

eriais. 574 J. I. Vaughan, Mitro-lane, near Kensal-green. 574 J. I. Vaughan, Mitro-lane, near Kensal-green. Improvements in treating, converting, and utilizing the metallic saits and sulphuric acid contained in, or derived from, the residual or waste liquors of tinned plate works and petroleum and parafiln refineries.

575 R. Morton, Bridge House, Nine Elms. Improvements in apparatus used in the manufacture of gas.

576 G. Rees, Holloway. Improved means of producing designs and devices upon the surface of glass and glazed

ware. 577 J. T. Griffin, Fleet-street, City. Improvements in harvesting machines.

577 J. T. Griffin, Fleet-street, City. Improvements in harvesting machines.

Dated February 25, 1869.

578 W. H. Tooth, Greenwich. Improvements in the manufacture of bricks, ties, and other articles made from plastic or silicious materials, and in the machinery or apparatus employed for moulding and pressing the same, part of which improvements are also applicable for compressing peat or other substances for the manufacture of artificial fuel.

579 E.A. V. Lerol, Rue Ste. Appoline, Paris. Improvements in the work produced by cards of carding engines.

580 W. Anyon, Manchester. Improvements in the construction of velocipedes.

581 H. Lowenberg, Chancery-lane. A new or improved compound to be used in the manufacture of hats, bonnets, and other articles of wearing apparel, and the means employed therein.

582 B. P. Walker, North-road House, Wolverhampton. Improvements in shaping and fluishing metallic and other articles by abrassion, and in the machinery or apparatus employed therein.

583 W. Turner, Hammersmith, Dublin, and J. W. Gibson, Dundalk, Louthshire. Improvements in friction rollers applicable to rolling bridges.

584 J. Moody, Heworth Green, Yorkshire. Improvements in the means and apparatus for mooring vessels or floating bodies.

585 W. Parkinson, Gloucester-grove West, Old Bromp-

floating bodies.
585 W. Parkinson, Gloucester-grove West, Old Bromp-

585 W. Parkinson, Gloucester-grove West, Old Brompton. Improvements in wood-cutting machinery.
586 W. E. Newton, Chancery-lane. Improvements in furnaces and apparatus for oxidizing and desulphurizing iron and other ores.
587 E. D. Barker, Weston-super-Mare, Improvements in apparatus for actuating railway brakes.
588 L. Engel, Mumford-court, Milk-street, City. Improvements in parasols and umbrellas or sunshades.
589 F. Brady, St. John's-terrace, North Gate, Regent's Park. Improvements in switch apparatus for railways.
590 W. R. Harris, Rue Gaillou, Paris, Improvements in the manufacture of weavers' harness or healds, and in the machinery used for that purpose.

Dated February 26, 1869.

Dated February 26, 1869.

591 W. T. Eley, Gray's Inn-road. Improvements in the onstruction of cartridge cases for breech-loading fire-

construction of carriage cases for School and Sams.

592 H. J. Ledger, Manchester. Apparatus applicable to railway carriages for enabling presengers to signal to the guard and driver of a train, and at the same time to communicate with, and receive assistance from passengers in any other compartment of the same carriage.

593 H. Harburg, Hatton-garden. Improvements in musical boxes.

594 T. Moore, South Stockton-on-Tees. Improvements in machinery ifor obtaining and applying power, appli-

594 T. Moore, South Stockton-on-Tees. Improvements in machinery for obtaining and applying power, applicable to the raising and lowering of weights, and to all other purposes where power is required.

595 W. R. Lake, Southampton-buildings, Chancerylane. An improved method of constructing ships and other vessels for carrying liquid cargoes.

596 J. Cheetham, Chadderton, Lancashire. Improvements in the form and manner of winding yarns, whether single or multiple, for convenience of carriage, and for facility in unwinding in the after processes.

597 J. A. F. Suter, Hereford, and T. C. Hinde, Fownhope, near Hereford. Improvements in furnaces, and in the combustion of fuel for melting steel, and for other purposes where high temperatures are required.

598 G. J. Hinde, Wolverhampton. Improvements in coating iron or steel with copper or brass or other alloys of copper.

coaing iron or steel with copper or brass or other alloys of copper.

#g.99 J. T. H. Richardson, Tutbury, Staffordshire. An improved method of cutting flint glass, such as is used for wines, goblets, tumblers, or other table glass, or for lamp or other glasses of a circular or oval shape, and in apparatus to be employed therefor,

600 J. Townsend, Glasgow. Improvements in extracting and in refining oils and other products from mineral and other materials containing carbon and hydrogen, and in apparatus therefor.

601 E. Falck, Cheapside, City. Improved apparatus for distributing liquids in a state of spray.

602 J. Reap and W. H. Michelmore, Borough-road, Southwark. Improvements in spring hinges.

603 C. Markham, Brimington, Derbyshire. Improvements in steam and other boilers.

604 W. A. Herring, Chertsey, Surrey. Improvements in pumps.

604 W. A. Herring, Christoff, 2015.

in pumps.
605 C. Williams, Sandy Hill-road, Plumstead, Kent. Improvements in apparatus for obtaining motive power.

Dated February 27, 1869.
606 J. Adams, Arlington-street, Sadler's Wells. Improvements in the means of communicating and signal ning between passengers, guards, and drivers of railway

trains.
607 W. Thomas and W. Davis, Aberdare. An improve-ment in the construction of winding machinery or appa-ratus employed in mines, shafts, pits, or lifts and inclined

ratus employed in mines, sharte, proceedings of the planes.

608 J. R. Croskey, King William-street, City. Improvements in looms for weaving.
609 R. Pyne, Wellington-street, Strand. An improved railway buffer carriage.
610 J. H. Johnson, Lincoln's Inn-fields. Improvements in machinery or apparatus for measuring raw silk.
611 C. Maw, Aldersgate-street, City. Improvements in cartridges for firearms and ordnance, and in torpedoes and similar explosive engines.

out C. Maw, Americane-street, City. Improvements in cartridges for firearms and ordnance, and in torpedoes and similar explosive engines.

612 T. S. Blair, Tavistock Hotel, Covent-garden. Improvements in the means and apparatus or machinery for effecting the mixture of molten cast from with solid oxides and other bodies.

613 E. Chapman, Green Dykes Mills, Egremont, Cumberland. Improvements in carding engines for flax. hemp, tow, jute, wool, and other fibrous substances.

614 T. Atkinson, Bradford. Improvements in means and apparatus for lighting domestic and other fires.

615 R. S. Norris, Liverpool. An improved method of getting coal, and for the machinery or apparatus connected therewith.

616 G. J. Snelus, Dowlais, Glamerganshire. An improved mode of, and means for reducing transcess.

getting cost, and for the machinery or apparatus connected therewith.

616 G. J. Snelus, Dowlais, Glamorganshire. An improved mode of, and means for, reducing iron ores.

617 L. G. Lysons, Meadow Bank Cutts, Aberdeen. Improvements in apparatus for signalling from the marker's
butt and firing party respectively, in rifle, carbine, or
artillery practice.

Dated March 1, 1869.

618 P. S. Regnauld, Paris. An improved mode of, and
apparatus for, fixing the lid and the bottom of tin canisters,
preserve, or other boxes to the body of them.

619 J. Ladley, Leeds. Improvements in machinery or
apparatus for spinning and twisting wool or other fibrous
substances.

apparatus for spinning apparatus for spinning substances.
620 R. J. Goodbody, Charville-square, Tullamore, King's County, and R. E. Donevan, Ashgrove House, Upper Rathmines, Dublin. Improvements in treating tobacco, and in apparatus employed for that purpose.
621 J. Rust, Lambeth. A new and improved composition specially applicable for use for pictorial and decorative nurposes.

sition speciary approach.

1 tive purposes.

622 W. E. Gedge, Wellington-street, Strand. Improvements in breech-loading firearms and in cartridges.

623 W. Simpson and A. Gardner, liford, Essex. Improvements in the construction of engines worked by

provements in the construction of engines worked by steam or other motive power.

624 A. H. Brandon, Rue Gaillon, Paris. Improvements in metallic cartridges, and in the methods of manufacturing the same.

625 W. R. Lake, Southampton-buildings, Chancery-lane. An improved lawn mowing machine.

626 D. Davies, Crumlin, Monmouthshire. Improvements in apparatus for getting coal, stone, slate, or mineral.

mineral.
627 J. Cliff, Runcorn. Improvements in the use and application of certain materials to be used as a substitute for fire-bricks.

## LIST OF SEALED PATENTS.

Sealed Febru	ary 26, 1869.
2661 E. Peyton	2773 E. Johnson
2663 D. Smith	2777 A. M. Clark
2668 G. Ker	2781 J. Shand
2670 B. Corcoran and W.	2795 W. R. Lake
Dunham	2796 A. C. Henderson
2674 E. Richardson	2864 A. F. Campbell
2700 W. C. Holmes	2910 W. H. J. Grout
2703 E. Jobson	3227 W. K. Foster
2704 W. R. Lake	3233 G. T. Boustleld
2708 J. Adams and H.	3393 G. T. Bousfield
Barrett	3511 H. D. Hoskold and G
2713 J. Evans	P. Wheeler
2714 J. I. Campbell	3528 B. Britten
2715 T. Forster and J.	3534 C. Descat and H
Heartfield	Guillaume
2744 T. Wilson	3565 C. D. Abel
2761 J. Jones	

Sealed Mar	ch 2, 1869.
Sealed Mar 2579 D. Martin, W. Small, A. Hutton, A. Key 2720 J. Griffiths 2728 B. Grafton 2728 D. Jones 2737 J. Pickering 2749 H. M. Lee 2752 G. Davies 2753 W. T. Carrington 2770 T. E. Clarke	
2774 J. Millward 2778 A. M. Clark 2793 J. Oliver and C. O. McAllum	3425 M. H. Davies 3814 J. Frazer and V Naar

## NOTICES OF INTENTION TO PROCEED WITH PATENTS.

#### From the "London Gazette," March 2, 1869.

3193 W. H. Howes 1	3304 J. G. Tongue
3196 W. Fitch	3309 W. H. Liddell
3204 E. T. Hughes	3322 W. E. Dando
3205 E. Harrison	3326 A. M. Clark
3208 E. T. Hughes	3352 M. Sautter
226 C. M'Millan	3380 A. M. Clark
3228 F. Bennett and R.	3387 J. H. Johnson
Ward	3401 W. R. Lake
3235 T. Carr	3422 R. Halliday
3241 W. W. Tonkin	3423 E. Madge
3242 J. de Redon and T.	3424 W. S. Thomson
Faucheux	3430 A. M. Clark
3243 J. Gregson and W.	3446 B. P. Walker
Monk	3448 R. A. Dalton and
3244 M. Sautter	G. S. Barton
3215 M. Sautter	3465 H. E. Newton
3247 J. Bernard	3536 W. R. Lake
3249 R. Ferguson and G.	3603 J. Sincock
Lord	3635 W. Naylor
3254 G. Nurse	8649 A. V. Newton
3256 A. Giraud	3650 A. Ransome
3259 S. Clark	3653 W. Betts
3261 H. Mayhew 3267 P. M. Crane 3269 B. Nicoll	3730 W. J. Tichthener
3267 P. M. Crane	3981 F. A. K. W. voz
3269 B. Nicoll	Oppen
3273 W. E. Gedge	3988 R. Griffiths
8277 T. Priestley and W.	121 C. H. Lea
Deighton	166 W. T. Eley
3279 F. Ransome	175 W. R. Lake
3286 J. B. O'Hea and W.	235 H. W. and R. Lafferty
Bullen	299 J. Tolson
3288 W. D. Young	370 W. R. Lake
3289 J. Wallace	386 W. R. Lake
3298 A. Wilson	402 B. F. Sturtevant
3300 G. E. Donisthorpe	443 A. V. Newton
3306 B. Dobson and J.	455 B. Hunt
Clough	I

Clough

The full titles of the patents in the above list can b ascertained by referring back to their numbers in the lis of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

### PATENTS ON WHICH THE STAMP DUTY OF 45 HAS BEEN PAID.

549 H. Bright	598 H. Wilson
554 C. J. Caumon	603 H. Robertson
576 T. Spencer	614 J. B. Booth
577 J. Petrie	625 J. Young
582 I. L. Pulvermacher	668 W. H. Berry
594 W. E. Gedge	872 A. V. Newton

# PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID. 392 E. Green and J. New-man 489 R. Waller 617 T. H. Wood

PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the fol-lowing numbers:—

3965	345	377	403	429	446	464	478
242	347	380	405	431	448	465	479
253	349	381	409	434	449	466	481
273	353	385	411	435	450	467	483
295	355	387	413	436	452	469	483
325	359	389	415	438	455	470	484
331	361	391	417	440	456	472	485
333	363	393	418	441	457	473	486
337	367	395	419	442	458	474	487
339	369	399	423	443	460	475	488
341	371	400	425	444	461	476	189
344	373	401	427	445	463	477	1

#### OF SPECIFICATIONS PUBLISHED, For the week ending February 27, 1869.

No.	Pr.		No.		Pr.		No.		Pr.		No.	1	Pr.	No.	Pr.		No.	Pr.	
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2183	3	4	22:	$\mathbf{s}$	3	0	22	61	0	8	228	ojo	4	2290	0	4	2315	0	4
2193	0	10	22:	0	)	8	22	64	0	8	228	1 1	- 0	2297	0	4	2316	! 0	4
2194	0	8	22:	17	)	6	22	65	0	10	228	3 1	2	2299	0	4	2317	1	0
2199	0	8	22:	8	ı	0	22	67	0	4	228	10	10	2301	0	4	2320	0	4
2204	0	8	22	13	)	6	22	68	0	4	228	5 <b> 0</b>	4	2302	1	2	2326	0	4
2217	3	4	224	16	l	0	22	69	0	4	228	- 0	4	2504	10	4	2331	0	4
2218	1	4	22:	17	ι	2	22	71	0	4	228	90	4	2307	0	4	2353	0	4
2219	1	0	22-	×	l	0	22	74	0	4	229	9 0	. 8	2308	0	4	2378	1	6
2220	0	8	22:	12	0	10	22	75	0	4	229	1 1		2300		4	2393	0	4
2221	0	8	22	3	0	10	22	77	0	4	229	3]0	4	2310	1	4	:399	0	8
2223	0	6	22.	7	0	8	22	78	0	4	229	4 0	4	2311	0	4	ł	ı	

NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be sent, payable to Riobertson, Broman, and Co., Patent Department, 166, Fleet-street, London, E.O., to whom all communications upon the subject should be addressed.

THE

#### **MECHANICS'** MAGAZINE.

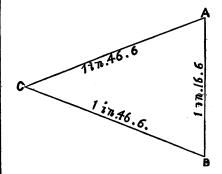
LONDON: FRIDAY, MARCH 12, 1869.

#### REVERSING STATIONS.

CHORTLY after the introduction of railways, when the locomotive mania was at its climax, it was little thought that the anticipations indulged in, the extravagant ideas entertained of its universal applicability, and entertained of its universal applicability, and the exaggerated notions of the loads to be drawn, and the velocity to be acquired, would ever have dwindled down to their present humble pretensions. It has been found impossible to carry out in their integrity the principles originally enunciated as governing the formation and the safe working of railways. Experience, moreover, has shown that with a diminution in the speed, steeper gradients and sharper curves may be employed with perfect safety than those which were assumed by the fathers of steam locomotion to constitute the limits of security. Stephenson was of opinion that no railway curve should have a radius less than a mile. What would he say if he saw engines running round the arcs of circles, of which the radii scarcely equal a quarter of that dimension?
As might be naturally conjectured, the first lines of railways were laid out through the most favourable districts, and those routes presenting the greatest advantage were eagerly seized upon by the engineers, who left their successors to make the best of what was left them. It was not, therefore, until rival lines began their existence, that it became evident that some departure from the orthodox plan of proceeding was absolutely necessary. This was indulged in at home to an extent far greater than what would at one time have been considered possible, but no sooner were railways transplanted, so to speak, to foreign countries, than a new system of formation was introduced which has completely inverted the original arrangement. So far as gradients are concerned, the St. John's Wood line, with its two mile gradient of 1 in 27, can challenge comparison with any mountainous railway that exists, and there are not wanting others in our own country in which the curves are so sharp as to forbid their being traversed at any other pace than that of a walk. Still, we have generally contrived to get from one level to another by proceeding in the same direction, notwithstanding that a good deal of winding and twisting may be necessary in order to reduce the gradient as much as possible. In mountainous countries, especially in India, where for a long time the lofty ghauts presented an impassable barrier to the inroad of civilization, it was soon discovered that it was practically impossible to rise sufficiently by the employment of the usual gradients and curves. Let the former be rendered as steep as locomotive agency would permit, and the latter as sharp as the slowest pace and the minimum of safety would allow, yet it was not possible to "get up the hill." In this emergency it became necessary to surmount the difficulty by successive forward and backward steps, as it were, and in this manner to gain the height required. Thus it was that reversing stations came into use, the nature of which we will now direct our attention to.

Everyone is familiar with the manner in which a horse, with a heavy load behind him, goes up a hill. Instead of proceeding in a straight direction, he climbs the ascent by a straight direction, he climbs the ascent by a laternative. The only rival safeguard against scries of diagonal or zig-zag lines, thus such accidents is a large amount of brake power, and, even in particular instances, not be carried out by the American upon the same principle that the trains are enabled to mount the sides of mountains, the enabled to mount the sides of mountains, the reversing stations or points being situated at would slide down the incline nearly as fast as which was formed some time since for the series of diagonal or zig-zag lines, thus reducing the steepness of the acclivity. It is upon the same principle that the trains are

the junction of every two diagonal lines. A glance at the accompanying diagram will demonstrate the advantages derived from this arrangement. There are, of course, some corresponding disadvantages which we shall allude to presently, but the chief of them can, with proper care, be provided for. Besides, there is in reality no choice in the matter. Unless the reversing principle be adopted, railway intercommunication cannot be established in mountainous and precipitous localities. Referring to the diagram, suppose



it be required to rise from A to B, and that by the employment of as many serpentine curves and of radii as sharp as possible, it is found that the distance between the two points cannot be made longer than 10,000ft. Let this distance be represented by the line A B, and let the point B be 600ft. above A. Since the distance between A and B 10,000ft., and the rise is 600ft., in order to rise from the lower to the higher level, the gradient would be equal to 1 in 16.6. This is too steep for any locomotive to accomplish, and consequently some other means must be devised for overcoming the difficulty. This is effected by running first from A to C, and then from C to B. Supposing C to be situated at a level of 300ft. above A, and A C to equal 140,000ft., the gradient from A to C and from C to B will be reduced to 1 in 46.6 and from C to B will be reduced to 1 in 46.6, which a locomotive can readily surmount. The engineering device of gaining height, by twisting the line as much as possible between any two levels, is familiar to all who are acquainted with the numerous railways in and about the suburbs of the metropolis. Common roads also afford abundance of examples.

Obviously, there is little or no danger in the reversing arrangement while the train is ascending, but the case is different when it is descending. Should the engine get beyond the control of the driver, or, in other words, run away, and overshoot the junction of the lines at C, the consequences must be of a most disastrous nature. Several fatal accidents of this description have occurred already in India, and the remedy does not appear very easy. There are three methods of pre-venting, or, at any rate, partially preventing the occurrence of such serious catastrophes. One would consist in prolonging the diagonal lines B C and C A to such a distance as would allow of the train being brought to In many instances, it would be absolutely impossible to accomplish this, and in all, from the peculiar nature of the very arrangement itself, it would be attended with great expense. Another method would consist in the crection of strong barriers at the points C and A, which, when properly furnished with buffers, would suffice to withstand the violent shock of the descending train, and bring it to a state of rest. Although such a course would be preferable to allowing the train to precipitate itself and contents down a precipice, yet it would constitute, after all, but a very rude and hazardous alternative. The only rival safeguard against such accidents is a large amount of brake

they would roll, and the barrier would have to stand the concussion. When it is borne in mind that many of these inclines in the ghauts are as sharp as 1 in 37, the velocity that a train would acquire in descending a distance of one mile can be readily imagined. That reversing points are an absolute necessity in carrying out steam locomotion in foreign countries, appears to be an established fact, but it is to be hoped that they will not be introduced wherever there is a single chance of avoiding them. They constitute an everlasting source of anxiety and danger, and in consequence of the accidents that have already occurred, means are being taken to abolish them in some of the situations where they were formerly deemed indispensable. Their danger was not fully understood until they were actually tried in practice, but now that the cost of human life has demonstrated the fact, the less use that is made of them the better.

#### THE DARIEN SHIP CANAL.

IN a short paragraph last week we briefly announced that the President of the United States had sent to the Senate, for ratification, a treaty which has been concluded with the Government of the United States of Colombia, respecting a ship canal across the Isthmus of Panama. This imacross the Isthmus of Panama. In Important circumstance has been brought about by General Caleb Cushing, to whom was entrusted the negotiation of the treaty, which grants extraordinary privileges for constructing the proposed work. By our last advices from America it appears that the full text of the treaty had not been prothe full text of the treaty had not been prothe full text of the treaty had not been promulgated up to Feb. 20, although the substance was known. From the American "Army and Navy Journal" we gather that the treaty grants the exclusive right to the United States to construct the canal anywhere between 4deg. and 18deg. north latitude. The Colombian government has aggred to give a large section of land on agreed to give a large section of land on either side of the route selected, and guarantees the perfect neutrality of the canal in time of war. This latter clause in the treaty was found most difficult to settle, and for a time interrupted the negotiations between Mr. Sullivan, the American Minister, and the Colombian authorities. Mr. Sullivan maintained that the right should be stipulated for Colombia and the United States to close the canal, in time of war, against the vessels of any nation with which either of them were at variance. Colombia was willing to agree to almost anything in order to secure the construction of the canal, but she was not quite ready to concede this point. If she did so, her statesmen argued, foreign nations other than the United States would make it the pretext for a quarrel, in which case she, being a weak nation, would receive all the blows, while the contesting nations would reap all the advantages. Mr. Sullivan insisting upon his point, the Colombian commissioners resigned, sometime in December, and thus brought the negotiations to an abrupt conclusion. General Cushing arrived abrupt conclusion. General Cushing arrived at Bogota on the 3rd of January last, specially commissioned by Sccretary Seward to conclude the treaty. A few days afterwards new Plenipotentiaries were appointed by the Colombian government, and the business was resumed with such energy, that in five days the terms of the treaty were settled, and a contract approved by the President. The neutrality clause, it appears, was adjusted in a manner which was considered fair to all parties concerned, and so arranged as not to give offence to European nations.

purpose, and which has capital waiting for treaty to be concluded. At the head of this band of capitalists stands the name of Commodore Vanderbilt, the remainder are gentlemen who, we understand, are amongst the foremost and most energetic capitalists in America. The question of connecting the Atlantic and Pacific Oceans has been mooted several times before the present. The undertaking, however, is of such gigantic proportions that, notwithstanding concessions quite as liberal as those now made have been offered before by the government of New Granada, none have been found equal to the task of even exploring, with any degree of success, for a route. The nearest step which was ever before taken towards constructing a canal was in 1853, when an English company was formed, with £15,000,000 capital, for the purpose of carrying into execution a plan of Dr. Edward Cullen, who had made some observations and assumed that, "if levels should prove as they were supposed to be, a canal capable of passing the largest vessels might be constructed from the bay of San Miguel, on the Pacific coast, to the bay of Caledonia, on the Atlantic."
The United States and Great Britain, by treaty, agreed to extend their protection to all parties engaged in the construction of the canal. After Dr. Cullen's plan had been thoroughly discussed, the English company determined to abandon it, and proposed to adopt one of the Nicaragua routes and build a canal of smaller dimensions. The United States government then withdrew its protection, which course was followed by a similar withdrawal on the part of Great Britain. The present project has formed the subject of no less than four previous characters are in the course of the less than four previous characters. of no less than four previous charters, which have been granted at various times by the government of New Granada and its successor, the United States of Colombia. One of these charters was granted in 1851; one in 1852; another, that to Dr. Cullen, in 1853; and a fourth, in 1855. These conceswere all made to private parties or sions corporations, as the governments avoided any alliances. The failure of private enterprise, however, has at last led to the conclusion of the treaty in question.

In constructing a canal across the Isthmus of Panama far greater engineering difficul-ties will have to be overcome than attended the construction of the Panama Railway, which was completed within five years. The length of that road is about 48 miles; its maximum gradient is 60 feet to the mile, and its summit level 259 feet above the sea level. To overcome such gradients locks will have to be constructed, and the main difficulty appears to be the finding of water for their supply. In 1843 two French engineers made examinations over the ridge of the Ahogaytequa, the highest point of which was two hundred and sixty feet above the sea. They could devise no other way of building the canal but by constructing a tunnel through the mountain, the level of which should be one hundred and thirty-five feet above tide, and the approach on the Atlantic side by eighteen locks, and on the Pacific side by being limited it was thought doubtful if any feasible system of reservoirs could be devised. We have at present no data upon which to found any further remarks upon the difficulties which must be overcome in building this canal. The Panama railroad route exhibits the one most easily surmounted, and even that may not be practicable for a canal. The plan of the French engineers, cited above, shows one of the chief difficulties in the way of the lock system—the insufficient supply of water. 'The gentlemen who have the undertaking in hand are men of experience in public enterprises; have doubt-less counted well the cost, and are prepared to execute this great undertaking even though they should be compelled to tunnel we wish every success.

the mountain at its base, or cross over it with locks, supplying the water to the reservoirs by artificial means. The great Central American Isthmus is, in fact, a chain of isthmuses, being formed of several necks, connecting large swells or lobes of extensive areas. Accordingly, we have the Isthmus of Panama at Panama; the Isthmus of Darien at the Atrato river; the Isthmus of Nicaragua at the lake of that name; the Isthmus of Honduras at the bay of that name; and the Isthmus of Tehuantepec at Tehuantepec. The general trend of the Pacific coast of Central America is northwest and southeast, but the Atlantic coast has a very irregular shore line. The Cordilleras, connecting the mountain systems of the country, lie near to and parallel with the Pacific coast. mountain system is the great obstacle to the construction of a canal. It may be easy enough to follow a river to its head in the mountains, but to cross in the ordinary way by a mountain summit level is almost impracticable, because there is no drainage basin or area available for supplying the high summit level with water, and the mountains could only be tunnelled at an elevation when the full-sized river could be diverted into the tunnel level.

We will not, however, meet these diffi-culties half way, but we will assume that they will be overcome by the engineering skill of our American friends, who have executed and are now carrying out works approaching in magnitude to those in question. By the completion of this canal, great advantages would accrue to America, and her commerce would make still more rapid strides than it at present is making. It is estimated that the saving in distance by the Isthmus canal will be as follows:-New York to Calcutta, 4,100 miles; to Canton, 8,900 miles; to Shanghai, 9,600 miles; to Melbourne, Australia, 3,340 miles; to Jeddo, Japan, 6,490 miles. Here is an immense saving in distance which is invaluable to commerce. Another point to be considered is that a canal would enable vessels to pass from ocean to ocean without breaking cargo. A smaller class of ships too could be employed in the carrying trade—vessels whose safety would be endangered by a passage round the Horn. It is estimated that the commerce around Cape Horn and over the Isthmus of Panama now amounts to about 3,500,000t ons annually, at an expense of, say, 10 dollars per ton, making a total of 35,000,000 dollars per year. Suppose half this expense should be saved by the construction of a canal, would not the enterprise pay, even if its building should absorb millions? The Panama Railway cost about 9,000,000 dollars, and nearly paid for itself in the first seven years. The road is now paying handsomely, and rewarding its shareholders with heavy dividends. The trade of England, France, and the United States, that would, in all probability, pass through the canal, has been estimated at 467,830,000 dollars, and as these figures were made up after careful study of the subject they may be deemed very nearly correct. It is estimated that the saving in money to the trade of the United States would be 36,000,000 dollars; to the trade of England, 9,958,000 dollars; to the trade of France, 2,180,000 dollars; and to the trade of the combined world, 49,500,000 dollars. Should the trade of the world increase in the same ratio—100 per cent.—for the next ten years, that it has for the past ten, there will accrue a saving of 100,000,000 dollars, when the canal is finished. These figures are of course only hypothetical, but enough has been said to show the importance of the scheme to the world in a commercial point of view, and to prove that a great saving would accrue to all nations from the construction of the canal. We shall watch with interest the progress of this great work, which we hope to see one day brought to a successful issue by our American friends, to whom

THE ROYAL INSTITUTION.

JUST before the beginning of the present century, Count Rumford, and a few other men of science, formed themselves into an association for the purpose of starting an institution devoted to philosophical research, and the popularization of science by means of lectures. A few houses in Albemarle-street were bought for the purpose, and in a short time the present Royal Institution building arose upon the site. The association was incorporated by a royal charter, and afterwards obtained further powers by an Act of Parliament. The opening proceedings at the Institution were characterized by great vigour, more than a dozen committees being appointed at the outset, to investigate different subjects, consisting principally of improvements in cooking and improvements in building. In fact, in those early days, the attempts of the managers were to promote the commercial applications of science, rather than to elucidate scientific laws; and the rules were so formed, that the shares in the Institution could be bought and sold in the market, and held forth prospects of commercial profit from the work done by the staff in Albemarlestreet. The constitution of the governing body was also partly hereditary in its nature, so that, as Sir Humphry Davy complained, people having no ability to take a share in the management possessed that power; wherefore, between the commercial and the hereditary principles, the Royal Institution was in a very few years brought to the verge of bankruptcy. Sir Humphry Davy then gave a lecture upon the difficulties into which the Institution had fallen, and told the members that they must either close the doors for ever, or abolish the hereditary feature in the management, cease the sale of shares, and allow the governing body to be elected by ballot, from the great body of the subscribers. The latter alternatives were adopted, and the Royal Institution fell gradually into the hands of members who took a warm and active interest in the promotion of physical science. At the present time, it is the best establishment in London for pleasing education in all branches of physical science, in lectures illustrated by good experiments, and given by scientific men of high ability. During the session, which lasts from January to June, day lectures are delivered from 3 to 4 o'clock, on Tuesdays, Thursdays, and Saturdays. There are also Friday evening lectures, to which members and their friends only are admitted. There is no doubt that intelligent children of twelve years of age and upwards would be benefited materially by being taken from school for six months, and allowed to attend lectures at the Royal Institution; such attendance also they might consider both a privilege and a holiday. More especially is such a course of value, because day by day the old plan of surfeiting children with dead languages is discovered to be bad, and more useful branches of education, such as physical science, are felt to be preferable. The Royal Institution is the scene of the labours of Davy, Faraday, Young, Brande, Frankland, and Tyndall. At the present time, the president of the Institution is Sir Henry Holland, Bart., M.D.; Dr. John Tyndall, F.R.S., is the professor of natural philosophy; Dr. William Odling holds the office of professor of chemistry; and Mr. Benjamin Vincent is the librarian. The library is a large one, and the reading room is well supplied with periodicals and newspapers. The lectures are delivered in a very papers. The lectures are delivered in a very commodious theatre, and the laboratories, in the lower part of the Institution building, are rich in philosophical experimental apparatus, which has been accumulating for the

past seventy years.

It being our intention to give, with tolerable regularity, notices of the work done at the Royal Institution, because it is a centre where all the sciences meet, we begin with the pro-ceedings of last week. On Tuesday, the Rev.

F. W. Farrar, M.A., F.R.S., lectured upon "Comparative Philology," and pointed out how nearly all the languages of Europe, and many of those of South-Western Asia, are derived from an extinct Aryan language, derived from an extinct Aryan language, once spoken by a people who lived probably to the north-east of India, near the banks of the Oxus. The Greek, the Sanscrit, the Latin, and the Keltic languages all sprung from this parent stock, and so, consequently, do the greater portion of the people who speak them. On Thursday, Dr. J. Harley lectured on "Respiration," and explained the general construction of the lungs, the heart, and the great disphragm which separates the lungs from the stomach below.

On Friday night, Mr. W. Huggins, F.R.S., lectured at the Royal Institution upon "The lectured at the Royal Institution upon "The Latest Discoveries in Astronomy made with the Spectrum." Sir Henry Holland, Bart., F.R.S., presided. The great theatre of the Institution was filled to overflowing, and among the listeners were Professor Tyndall, Admiral R. H. Manners, president of the Royal Astronomical Society; the Duke of Argyll; General Sabine, president of the Royal Society; Professor Frankland, F.R.S.; Professor W. Allen Miller, F.R.S.; and the Archbishop of York.

Archbishop of York.

Mr. Huggins said that the fact that messages recorded in the light of the stars many years ago can now be read by the aid of a glass prism, sounds more like romance than sober reality. A beam of light can be dis-sected and its different waves spread out in a band of brilliant colours for quiet examination, this band being what is known as "the spectrum." Spectra are of three types; all white hot solid or liquid bodies give in the spectroscope a brilliant unbroken rainbow band, or, in other words, a spectrum of the first order. Incandescent gases do not give a continuous spectrum, but a few bright vertical lines only. When an incandescent body is surrounded by a gas or vapour, a nearly continuous spectrum, cut vertically here and When an incandescent body there by a few hair-like black lines, is the result; and these lines, by their position, give information as to the gases by which they are produced. Thus, on examining the light coming from any fixed star by the aid of a telescopic object glass and a star spectroscope, the spectrum at once gives plenty of informa-as to the nature of the source of light, and further particulars may afterwards be obtained by measurement of the positions of the lines. After explaining that there are some conditions which modify the character of the spectra thrown by a few chemical substances, Mr. Huggins said that in some cases the spectrum is adapted to tell whether the luminous body is approaching to the observer, or receding from him. The stars, though receding from him. The stars, though apparently motionless, are not so in reality, and the motions of some of them which move transversely to the observer have been measured by good astronomical appliances. if the star be approaching or receding in the line of sight of the observer, its motion cannot be detected by measurements, nor by photometrical instruments, because many of the stars are variable, and an increase or decrease of brightness may not depend upon change of distance. To detect these motions, the spectrum has at last been found useful, for it is evident that if a star be moving towards the observer, more waves of light will be thrown into the spectroscope in a second than if the star were standing still; on the other hand, the receding motion of a star would cause a reduction in the number of waves entering the spectroscope in a given time. The effect of such motions is not to alter the colour of the star to the eye, but to slightly shift the positions of the lines in the spectrum. The shifted position of the chief hydrogen line in the star Sirius indicates that the star is receding from us at the rate of 41 miles per second; but as the observer was stationed upon the

from Sirius at the rate of 12 miles per second, this modification gives 29 miles per second as the rate of recession of Sirius. Measurements prove that it is almost certain that our sun, earth, planets, and solar system are moving from Sirius towards Hercules at a speed of 4 or 5 miles per second, and this further modification gives the amount of recession of Sirius from the earth as about 261 miles per second, as revealed by spectrum analysis. This true motion of Sirius is mixed, of course, with the transverse motion. The lecturer said that the nebulæ show mostly three bright lines like those from incandescent They probably contain nitrogen and gen. Comets give three bands of hydrogen. light, and appear to contain carbon as one of their constituents. Mr. Huggins closed by calling attention to his latest discovery of a method of seeing the solar prominences by direct vision without an eclipse. It being known, by observations of the last eclipse in India, what light is emitted by the prominences, Mr. Huggins searched for a coloured glass which would transmit the chief light emitted by the prominences, but cut off all other rays, so as to get rid of the excessive brightness of the limb of the sun as seen through the telescope. A spectrum was thrown upon the screen, and a piece of the red glass was interposed in the path of the rays, when it was seen that the glass cut off all the light except a narrow red band. With a piece of such glass in the telescope, the prominences may be seen with difficulty under favourable conditions.

On Saturday afternoon, Dr. William Odling, F.R.S., lectured for the eighth time, at the Royal Institution, upon "Hydrogen and its Analogues." One of the most striking of his experiments was an exhibition of the combustion of phosphuretted hydrogen in oxygen. Phosphuretted hydrogen is a very inflammable gas, which catches fire at once when it is exposed to air. Dr. Odling took a tall and very narrow glass jar, about 21 in. in diameter, and 18 in. long, and half filled it with oxygen over a glass pneumatic trough, full of water. A few bubbles of chlorine were then mixed with the oxygen. The great tube, half filled with oxygen, was then held firmly in the left hand, and, with the right hand, phosphuretted hydrogen, from an inverted test tube, was allowed to ascend one bubble at a time into the oxygen. Directly the bubble burst at the surface of the water, it united with the oxygen with a brilliant flash like lightning, at the same time giving the jar a violent shake. The experiment must be performed not many minutes after the chlorine has been added to the oxygen, otherwise two or three bubbles may enter the jar without catching fire, and then all go off at once with a dangerous explosion. For many reasons, it is not an experiment suited for those unskilled in chemical manipulations.

### STREET TRAMWAYS.

OF the twenty-eight schemes for railways, tramways, and other improvements or works connected with the metropolis, for which plans were deposited at the Private Bill Office, up to November 30 last, in accordance with standing orders, above half have already dropped out of existence from the failure of the promoters to make the necessary deposits. or other causes. In some instances, no bill has followed up the plan; in others, the House has refused to send the bills "upstairs," but has thrown them out on the motion for the second reading, without inquiry into the merits. The plans deposited included fifteen for railway works, four for street tramways, and nine for miscellaneous projects. Brighton and Metropolitan line of 46 miles was by far the most important of the railway bills; and, next to it, perhaps, the underground earth, which is a moving platform, an allowance line between Clapham and London Bridge. must be made. As the earth was moving Both of these were dropped at an early stage.

Of the tramway schemes, the most extensive was the system of which Mr. T. Page, C.E., was engineer—the Tramway Company—by which it was proposed to lay down above 60 miles of street tramway in London and the suburbs. The extent and the varied ramifi-cations of this scheme were probably a cause of its failure, the formalities to be observed in relation to tramway bills as regards county and parish notices, deposits of plans and bills, and other particulars, being of a very onerous character. From whatever cause, although the plans were duly deposited on November 30, copy of the bill was not forthcoming, as required, on December 23, and the scheme consequently fell through. The other three tramway schemes have been kept upon their legs to the present time; standing orders have been complied with, the bills have each been read a first and second time, and committed, which is a great point gained. three are—the Metropolitan, for about 16 miles on the north of the Thames; the Metropolitan Street, for about 19 miles on the south of the Thames; and the Pimlico, Peckham, and Greenwich, for about 7 miles, the greater portion, as the designation implies, also to the south of the Thames.

Last year, a tramway bill was granted for Liverpool, but none of the three bills for street tramways for the metropolis reached a second reading or committal. Two of the bills now committed, the Metropolitan and the Metropolitan Street, have been petitioned for in previous sessions; the third, the Pimlico, Peckham, and Greenwich, is a new bill. It is probable that the consideration of these bills in committee—the three are to be con sidered by one and the same committee—will excite more lively interest than the proceedings in relation to any other private bill of the session affecting London. It may be that the promoters have been more strenuous and persevering than on former occasions to excite interest and to conciliate support; if so, they have fair reason to be gratified by the success they have achieved. They have success they have achieved. appealed to local boards of works, to vestries, to open public meetings of ratepayers, and, to some extent, to the inhabitants of the districts chiefly interested, and, in almost every case, have obtained cordial promises of support, and large majorities. In some instances, indeed, the most lively interest has been manifested, and resolutions of support have been adopted unanimously with enthusiasm. In the debate in the House of Commons, a few days since, which resulted in a division, on the motion for the second reading of the Metropolitan Street Tramway Bill, the second reading was carried by a vote of 209 to 78. The motion was supported by Mr. Lefevre, the Parliamentary representa-tive of the Board of Trade, who announced, officially it may be presumed, that it was the wish of the Metropolitan Board of Works, and of the Board of Trade, that the bills should be referred to a select committee. Mr. Locke, the member for Southwark, would have thrown out the bills without inquiry into their merits, the most notable points in his speech being a sneer at the promoters as American "philanthropists," and a condemnation of the tramways laid down by Mr. G. F. Train some years since. The members of the House of Commons, and the public generally, have outlived this sort of thing, and are disgusted with such a puerile mode of dealing with an important question. Mr. Maguire, the member for Cork, applied the merited rebuke that we were indebted to private speculators, to the energy of capitalists, combined with the energy of the people, for many of our most important social undertakings, and such associations were not to be put down, or the public denied the beneficial results of their joint action, by a mere sneer

at projectors.

It is perfectly notorious to every one acquainted with the subject in the slightest degree, that no one proposes to lay down

Train's rails, or anything resembling them in form, or obnoxious to their radical defect of breaking the general level of the street. At the office of the Metropolitan Street Tramway Company, in Kennington Park-road, which is open to the public, there is quite a little museum of tramway models and samples. The patterns of rail include a short length of Train's rail, as actually used, a piece of the rail in use at Birkenhead, the rail sanctioned by the Corporation of Liverpool, and to be laid in the streets of that town, with several other modifications, all of which are essentially different from Train's rail in this respect, that they have each a groove on the face of the iron rail—so narrow, from 1in. to 1\frac{1}{2}in., that no ordinary wheel can get into it; whereas Train's rails really produced a groove on the road-way 4ft. 8in. wide, and in deep, which vehicles got into very easily, but could not get out of again. The one form of rail, presenting two continuous breaks in the level of smooth iron edges, exposed horses and vehicles to danger or damage in crossing, even at a right angle, but much more so in crossing obliquely. The rails now employed, crossing obliquely. The rails now employed, including the samples above referred to, can offer no obstruction to the passage over them, in any direction, of other vehicles or of horses; the grooves are too narrow to admit the wheel tyre of a lady's phæton, or to catch the cork of a pony's shoe. The approved Liverpool rail has an excellent feature in the corrugation of the portion of the surface of the rail to the inside of the groove. The rail is about 4in. broad in all, and has the groove, which is a little more than 1in. wide at the top, or widest part, near the centre. surface of the rail is smooth to the outside of the groove for traction, and corrugated on the inner side, to afford better foothold to horses crossing; the surface of smooth iron on the roadway is thus reduced to a minimum.

The particular form of rail to be adopted, and the materials to be employed in the construction and maintenance of the tramway between the rails, and a belt of 18in. on each side, which the bill provides shall be done at the expense of the companies, will be subject, of course, to the approval of the Metropolitan Board of Works and the Board of Trade. Granite sets, between the rails and on each side of them, will probably be preferred, as best fitted to secure good working condition in the rails, to avoid the formation of ruts, and to prove most economical in the long run, although involving a much heavier first cost than the ordinary rough metal. There is no reason to fear that any mechanical difficulty will be met with, either as regards the form of rail, or in other respects, to prevent the perfectly safe and successful working of the system. It was well and cogently remarked by Mr. Whitbread to the House of Commons, in the debate referred to, that it was no reacon that because a bad system failed ten years ago, a good system should not be tried now, We venture to think with Mr. and succeed. M'Arthur, the member for Lambeth, who has experienced the comfort and convenience of the street railway cars in the crowded thoroughfares in New York, that if street railways were once fairly introduced in this metropolis, such advantages would result that everybody would oppose the idea of their discontinuance. Mr. Laird, too, the member for Birkenhead, bore his "emphatic testimony" to the value of tramways in the town he represents, where they run from the ferry to the very heart of the town, as also the six miles along the Liverpool Docks, without the slightest inconvenience to the general traffic. It is to be hoped that a mode of street loco motion, which has proved of signal public advantage in all the great cities of the United States of America and of Canada, and which is so highly appreciated at Birkenhead, that a boon, granted last year to Liverpool, Virtue and Co., 26, Ivy-lane. 1869.

will not be longer denied to London, for no better reasons than the vague supposition that tramways will answer in almost any thoroughfares in the world excepting the suburbs of London, and that the London General Omnibus Company "have taken measures to oppose the scheme."

#### TELEGRAPHIC LITERATURE.

T is some little time since Mr. Sabine published his for ball lished his first book on "The History and Progress of the Electric Telegraph." The edition which then appeared consisted of two parts—the history of the electric telegraph, and its science and practice. The work met with a great deal of attention, and a vast amount of new and useful matter was brought out in the second part. "It has now," according to the author's preface, been decided to separate these parts into distinct volumes, it being thought that there are many who, whilst interested in the history and apparatus, may not care for the scientific part; whilst others, and especially those connected with telegraph engineering, may find only the information collected in the second part useful to them. For carrying out these objects there could be no better channel than 'Weale's Rudimentary Series,' the high character of which has rendered it deservedly celebrated." We cordially endorse the author's remarks, and feel glad to see some really good works on telegraphy added to the few that have already appeared in this series. The object of the present book\* is to give an account of the gradual rise and progress of electric telegraphy from the earliest known date down to the present time, including accounts of the various discoveries and inventions that have principally tended to produce the great results we are every day in the habit of witnessing.

In tracing the early history of telegraphy. very interesting fact has come to light respecting the peculiar knowledge Galileo had of magnetic action; and in one of his dialogues, written in 1632, the following conversation takes place (the discovery of this fact is due to Mr. Richard Bellamy, who called the author's attention to it, and to whom, also, we are indebted for the translation), "You bring to my recollection a pertion), "You bring to my recollection a person who offered for sale to me a scientific secret, which, through a certain sympathy, and a magnetic needle, enabled two persons to discourse with each other at a distance of two or three thousand miles. And when I told him that I would gladly purchase it, provided I first had a proof of his art, and that it would suffice for the matter if I placed myself in one corner and he in another corner of the room, he answered that it was scarcely possible to discern the operation in so small a distance Wherefore I sent the man away, and said that at that time it was not convenient for me to go to Egypt or Muscovy for the sake of trying the experiment; if, however, he was willing to go there, I would undertake the other parts, remaining in Venice." There are several instances in the early writers of sympathetic telegraphy, but it appears that this is the only one where there is something really tangible as to the modus operandi. Bellamy deserves our best thanks for bringing to light so interesting a conversation bearing on the early history of telegraphy.

The following are the principal points in this work—early observations on electrical phenomena, telegraphs by frictional and voltaic electricity, and by electro-magnetism and magneto-electricity. An excellent and most useful description is given of the various telegraphs now in use. Treating of con-

struction, we find a large amount of information on overhead and submarine and underground lines; and the final chapter is given to atmospheric electricity. We feel sure that this edition, containing so much and such useful matter to the practical telegraphist, will be welcomed by all engaged in the profession as a most useful addition to their

telegraphic library. We turn next to a brochure on telegraph companies as investments,\* the author of which justly considers that they have not. up to the present time, met with that support that their prosperity and merits deserve. His remarks are, however, principally applied to submarine cables as an investment, and in proof of the policy of laying out one's money in such concerns, he points out, and enters into, some details of the Anglo-American Telegraph Company, with their property of two Transatlantic cables. There is much in this portion of the brockure that all who are acquainted with telegraph matters must recognize as being correct, but the want of confidence subsequently shown by the public to submarine enterprise must not, as he apparently does, be set down to a want of confidence in cables themselves, but due entirely to a want of confidence in anything

—a result perfectly natural after the fearful panic of 1866. The successful operations connected with the Atlantic cable in 1866, and the two successful repairs in 1867, have acted most favourably towards submarine cables, and the result is now evident—the money panic having worn off—in the eager way in which submarine telegraph companies are generally invested in. A comparison is made between submarine lines and land lines, in the annual amount of maintenance that they respectively cost, very much to the advantage of cables; but the author, probably from a want of engineering knowledge of the subject (which may be several times subject (which may be several times noticed) forgets that the annual sums expended on the maintenance and renewal of land lines keeps that property always at its full value; whilst the maintenance of a cable consists only of repairing any accident that may happen, the expenditure on that account only restoring to good condition the part specially affected, whilst the whole property is gradually and surely depreciating.

With regard to East India communication, the author proposes the one remedy of having a submarine line from Land's End to Bombay, via Gibraltar, Malta, Alexandria, and Suez. "The only thing wanting in this wonderful (sic) scheme is the money to carry it out." We quite agree. But while recommending this scheme, he does so at the expense of the Persian Gulf route, which is characterized as "almost useless" (although communication with India has well and satisfactorily been carried on by means of this route for several years), and also of the proposed line from Suez to Bombay. But, unfortunately, the author quite forgets that the arguments he appears to think so strong against the line from Bombay to Suez are stronger against the proposed scheme. There is much in the subject that requires attention, and we are surprised that submarine telegraph shares are not more in request; but we feel sure that any new telegraph scheme will succeed far more on its own individual merits than by the attempt of running down projects that are, and indubitably will be, of advantage.

#### PARLIAMENTARY NOTES.

N the House of Commons, on Thursday week, Mr. W. EGERTON asked the Secretary of State for the Home Department when the report of the commissioner appointed to inquire into the opera-

<sup>&</sup>quot;Telegraph Companies Considered as Investments; h remarks on the Superior Advantages of Submarine with remarks on the Superior Advantages of St. Cablea." By J. WAGSTAFF BLUNDERL, Public Ac London: Effingham Wilson, Boyal Exchange.



tion of the Bleachworks and Printworks Act, which was promised at the end of last session, would be laid upon the table, and whether he intended to bring in any bill on the subject during the present session.

Mr. Secretary BRUCE replied that the commissioner had unfortunately been ill, or the report would have been presented. The commissioner, however, was now busily engaged upon his report, and, should there be time to do so this session, he (Mr. Bruce) hoped to embody some of the recommendations in a bill.

On the same evening, Mr. S. HARDY asked the First Lord of the Admiralty whether the reductions contemplated in the coast-guard ashore were to be general throughout the kingdom or confined to particular stations; and, if the latter, whether he would object to name the stations affected by

Mr. CHILDERS said that the reductions were shown in the estimates for 1869-70. The number of the coast-guard on shore at present was 4,850, and it was proposed to reduce that number to 4,625, or by 225 men, of whom 50 were civilians and 175 seamen. The reduction would be over the whole service, and the average reduction would be four at each station.

MR. WHITE asked the First Lord of the Treasury whether, after the recent declaration of the Secre tary of State for War, that "it would be very unfortunate if the patronage connected with the army were transferred from the Field Marshal Com manding in Chief to a political officer," it was the intention of her Majesty's government to revive the office of Lord High Admiral, and transfer to him the naval patronage now vested in the First Lord of the Admiralty.

MR. GLADSTONE, - Sir, my hon. friend has framed a proposition of four terms. He thinks that as the Secretary of State for War is to the Field Marshal Commanding in Chief, so is the First Lord of the Admiralty to the Lord High Admiral. I apprehend. however, that that is not the fact. The Lord High Admiral is a great officer of state, who, according to the ancient arrangements of the country, was charged not only with the patronage, but with the whole of the administration of the navy. The First Lord of the Admiralty is simply the firstnamed member of a commission to whom is now entrusted the duties of the Lord High Admiral, precisely as the duties of the Lord High Treasurer are entrusted to the commissioners of the Treasury. I do not, sir, propose to revive the office of Lord High Admiral. The statement was received with

some merriment by the House.

The most important event of the present week was the moving the estimates for the navy by Mr. Childers, on Monday night. The House having gone into a committee of supply, Mr. Childers commenced his remarks by reminding the House that the Speech from the Throne, at the opening of the session, had referred to certain reductions of naval expenditure, the right hon. gentleman stated that upon a comparison of the estimates for the year 1869-70, with those for the current year, the former showed a reduction in round numbers of £1,100,000, and compared with the previous year of £1.300, 000; and this reduction was distributed pretty fairly all over the votes. He then passed on to the subject of the governing body at the Admiralty, observing that it was not intended to make any change in its constitution, but to carry out the objects of the commission of 1860-61. The first Sea Lord of the Admiralty, therefore, would take charge of all business connected with the personnel of the navy; the Controller of the Navy would take charge of all the business connected with the materials of the navy, the dockyards, and the purchase of stores; and both those great officers would be directly responsible to the First Lord without the intervention of either board or commission. Another arrangement was to get rid of the division now existing between Whitehall and Somerset House; and in effecting the union of these establishments at Whitehall, he had done his best to act kindly and tenderly towards the civil service; so that, up to this time, he did not be that any injustice whatever had been done. Those who had been discharged were placed upon a redundant list, and so long as any efficient persons remained on that list, the vacancies occurring in the service would be supplied from it. Time had the service would be supplied from it. Time had not yet admitted of his taking up in detail the administration of the several dockyards; and all he had been able to do was to effect some minor

changes in respect of the number of officers and the business of the yards. It was proposed, however, to carry out a unity of management as far as possible. Instead of having the constructor of the navy and the head of the steam department two co-ordinate departments, they would be brought into one focus; so also would the master shipwright and the engineer, and this had already been done at Chatham and Portsmouth. The dockyards at Woolwich and Deptford would be closed on the 1st of October next, the Government being of opinion that they were not required. He was desirous, without delay, to utilize the ground, machinery, and plant at Woolwich by employing them as private establishments, if persons could be found to take them; but it would be disadvantageous to sell them at present.

Mr. Childers then went into the question of Mr. Childers then went into the question of the policy of the Government with respect to our fleets and men. He observed that at present we had 80 ships manned by 11,767 men on the southeast coast of America, the Pacific, the Australian, and China Seas, and on the west coast of Africa; and those would be reduced to 64 ships and 8,500 men. Three ships would be taken off the west coast of Africa alone, and India would have to bear her share of her naval protection. No final decision had yet been come to as to the Medidecision had yet been come to as to the Medi-terranean and North American fleets. The policy of the late Admiralty of sending out a flying squadron to visit the several foreign stations would squaron to visit the several foreign stations would be acted upon, he hoped, early in the spring; and a reserve squadron would be formed, to consist of four ironclads, four line-of-battle ships, and the Mersey frigate. In the Naval Reserve the only changes made were in the details, but in the cours of the year it would be advisable that the Admiralty and the Board of Trade should institute a departmental inquiry into the whole of the arrangements connected with that branch of the service. The number of men he proposed to ask for was 63,300, as against 66,770 the previous year; but he confessed that he could not take credit for the whole of this reduction, the greater portion of it having been effected by his predecessor, Mr. Corry. The reduction would be entirely in the non-seamen. It was not intended to have a single blue jacket less, but to retain the number which he found on the but to retain the number which he found on the books when he assumed office. He proposed, however, to reduce the half-pay list of officers, especially of captains, commanders, and lieutenants, in a practical way. With this object a bill would be brought in for compounding with such of these gentlemen as could be spared, and paying them a lump sum in lieu of half-pay. This could be accomplished without the smallest loss to the country: the half-pay would continue to be voted, but it would be paid over to the Commissioners for the Reduction of the National Debt, and they would compound with the officers.

Next, with regard to the ship building and manu-

Next, with regard to the ship building and manurest, with regard to the snip building and manufacturing departments, the right hon, gentleman said he should minimise repairs and alterations. The period for which ships were commissioned would be increased from three or four years to five years, the effect of which would be greatly to five years, the effect of which would be greatly to reduce the expenditure. It was also intended to overhaul the stocks and stores in all parts of the world, and to re-cast the existing establishments. The dockyards would be maintained up to the point of efficiency, the reductions there being made gradually. Private yards would be resorted to as an adjunct, and the Naval Stores Act, which forbade the sale of old materials, would be repealed.

Upon the subject of new ships Mr. Childers stated that it was proposed to build at Chatham and Pembroke, at the beginning of the next financial year, two fixed turret ships which would be the most powerful in the world. A third ship, with a revolving turret, would also be constructed, and be

the most powerful in the world. A third ship, with a revolving turret, would also be constructed, and be an improved "Hotspur." When all the arrangements contemplated had been effected, our navy would consist of \$6\$ broadside armour ships, carrying \$25\$ guns; eleven turret and special ships, carrying 43 guns; 66 efficient unarmoured ships, and a considerable number of old ships; and no other naval power had a force that could compete with this fleet. In conclusion, the right hon, gentleman expressed a confident opinion that the several arrangements made and contemplated would work for the benefit a connect opinion that the several arrangements made and contemplated would work for the benefit of the public service, and moved a vote of 63,300 men and boys for the sea and coast-guard service for the year ending March, 1870, inclusive of 14,000 Marines

At the conclusion of this speech, which was of great length, Mr. Corry minutely criticised the exposition of Admiralty changes and reforms, observed that he had not intended to lay down any more armour-plated ships until the result of the experi-ments now in progress had been ascertained. He denied that the late Government had proposed a permanent increase in the navy estimates, and enumerated the reductions which he himself hoped office, and He to have accomplished had he remained in office which would have amounted to £658,000. objected to the proposed diminution in the number of coast-guardsmen and stokers, and expressed his apprehension lest many of the reforms had been Philosophical Society.

hastily made, and would not prove advantageous to the public service. As to the new turret ships, he would never have entertained the idea of building sea-going ships without masts, and unless the project were postponed until after the trial between the "Minotaur" and "Captain" had come off, he should divide the House on the vote.

A considerable amount of discussion followed Mr. Corry's remarks, and ultimately the vote was agreed

ON MICROSCOPICAL EXAMINATION OF DUST.\*

BY MR. J. B. DANCER, F.R.A.S.

THE author stated that he had made some mi-croscopical examinations of dust collected in L croscopical examinations of dust collected in June, July, and August last, and also of the particles contained in the rain water after the long drought. He had intended to bring these observations before the Society in a complete form, but had not hitherto found time to do so. He proposed to carry on observations during every month in the year, for the purpose of recording the average amount of solid matter deposited in a given area, and also as far as possible to ascertain the character of the deposits. The observations so far had shown, as might have been expected, that the dust in various localities, at different altitudes, and under other varying conditions, contained particles differing in magnitude, appearance, and quantity for the same superficial area. In every instance, molecular activity was abundant, but the animal life was very variable in amount, the largest number of moving organisms being in the dust collected at the lowest points; this was about 5ft. above the surface of the earth. This dust also contained the largest proportion in magnitude and quantity of vegetable matter. These observations also showed that in thoroughfares where there were many animals engaged in the traffic, the majority of the light dust which when disturbed reached the average height of 5ft., or about the level of a foot passenger's mouth, consisted of a large proportion of vegetable matter which had passed through the stomachs of animals, or which had suffered partial decomposition in some way or other. That was not an agreeable piece of informa-tion, but it was a fact. It showed the necessity, in a sanitary point of view, of the streets being well watered before the scavengers were allowed to commence operations; otherwise the light dust was only made to change its locality, and was not properly removed. It was not pleasant to contemplate the possibility of germs of disease being wafted along with that decaying matter, and inhaled by those whose condition might be favourable for its development. The author hoped to bring the details of the observations before the Society at some future time.

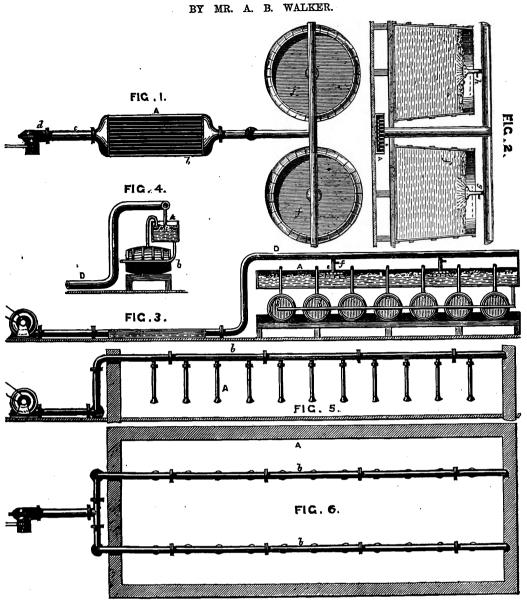
#### BULLION AND SPECIE.

THE value of gold and silver bullion and specie imported in the year 1999 THE value of gold and silver bullion and specie imported in the year 1868 was £24,852,595, against £23,821,047 in the previous year. Of the total value imported last year £17,136,177 is returned under the head of gold, the chief portion of which was received from Australia, £6,989,594; United States, £6,976,455; and Mexico, South America (except Brazil), and West Indies, £1,252,816. The imports of silver bullion and specie in 1868 amounted to £7,716,418, of which £3,203,972 was received from Mexico, South America (except Brazil), and West Indies, £1,915,939 from the United States, and £1,045,317 from France. The value of gold and £1,045,317 from France. The value of gold and 14,327,289 in 1867. Of the total value exported last year £12,708,308 is registered as gold, the chief portion of which was sent to the following countries, viz., to France, £7,189,646; Egypt, 1,497,826; Hanse Towns, 1,094,311; and Brazil, 1,018,240. The exports of silver bullion and specie in 1868 amounted to £7,511,706, of which £1,855,253 was sent to Holland, £1,821,748 to France, £1,489,165 to Egypt; £903,669 to Hanse Towns; and £843,235 to Belgium.

THE forty-seventh annual meeting of the Printers' Pension, Almshouse and Orphan Asylum Corpora-tion was held on Monday at the London Tavern, under the presidency of Mr. W. Rivington. After under the presidency of Mr. W. Rivington. After the adoption of the report, a resolution was proposed, and duly carried, sanctioning the transfer of the en-gagements of the Printers' Orphan Asylum and the Printers' Almshouse Society to the above corpora-tion. The appointment of officers was then pro-ceeded with, and the meeting concluded by a vote of thanks to the chairman. thanks to the chairman.



#### TUN-ROOM ATTEMPERATOR. ATMOSPHERIC



## WALKER'S ATMOSPHERIC TUN-ROOM ATTEMPERATOR.

WALKER'S ATMOSPHERIC TUN-ROOM ATTEMPERATOR.

Our readers do not require to be reminded that at no stage in the manufacture of beer is more vigilant care needed than at the fermentation of the wort. They are also fully aware of the value of a low temperature for producing a healthy and vigorous fermentation and for the preservation of the yeast. To secure this advantage, even in the hottest weather, has been the aim of Mr. A. B. Walker, brewer, of Warrington, and he realized his ideas in the atmospheric tun-room attemperator illustrated in the accompanying engraving. By this apparatus that portion of the atmosphere directly over the worts in a state of fermentation in the gyle tuns is attemperated, in summer or in winter, to that degree of temperature at which the process of vinous fermentation is most successfully conducted. In our engraving, figures 1 and 2 illustrate the application of the attemperator, a being the attemperator, which is a rectangular frame carrying a series of tubes b, placed about 5 in. apart. Ice, or any other cooling substance or freezing mixture, is placed in the spaces between the tubes, which are connected at one end by the pipe c, to the fan d. At the other end of the casing the tubes communicate with the pipe e, which is carried to the fermenting tuns ff. From each of the branch tubes over the tuns is a vertical tube g (fig. 2), ending in a rose, through the perforations in which the air makes its exit. The supply of air is regulated by the slide h, so as to suit the progress of fermentation. The fan is set in motion as soon as fermentation commences, and a cool stream of air is playing over the surface of the wort until fermenfermentation. The fan is set in motion as soon as fermentation commences, and a cool stream of air is playing over the surface of the wort until fermentation is complete. In very cold weather the freezing mixture is generally found to be unnecessary, the air from the fan alone sufficing for a healthy fermentation. Mr. Walker's experience is, that since the adoption of the attemperator he has never had any languid or sluggish fermentations.

To preserve the yeast in the trough during the process of cleansing, Mr. Walker adopts the system illustrated in figs. 3 and 4 of our engraving. The yeast passes into the trough or receiver a from the puncheons b b; a tube d is in connection with the attemperator, and from which the air is distributed over the surface of the yeast by means of the pipes s, the supply being regulated by the valve f. By this means, Mr. Walker finds vigour and vivacity imparted to the yeast, which is thus properly preserved.

This principle of attemperation has been applied to the manufacture of malt, so that it may be made in summer as well as in winter with equally good results. To this end the arrangement shown in figs. 5 and 6 is proposed by Mr. Walker: a is the malting room through which the pipes b b are led from the attemperator, at the height of a few feet above the floor level. To these pipes are attached the vertical flexible tubes c c, which are fitted with rose perforated caps, through which the cool air is distributed over the surface of the malt on the floor. It will thus be seen that Mr. Walker effects three very important improvements in the brewing processes, by the aid of of apparatus as simple as it is ingenious, and which will doubtless come into use wherever its merits are known. We may add that this apparatus is now being manufactured by Messrs. Morton and Wilson, of Alliance Chambers, Borough, London, and Stockton-on-Tees.—"Brewers' Journal." This principle of attemperation has been applied

#### COAL AND IRON ON THE CONTINENT.

THE iron trade displays more or less activity in all the French metallurgical groups. In the south of the Moselle, for instance, there are now orders on hand for some months in advance, while they still continue to arrive; since the summer, prices have advanced in this district 12s. per ton. The Terre Noire Company has obtained an order for 2,000 tons of Bessemer steel rails at £18 11s. 10d. per ton

delivered at Gray, and another for 6,000 tons at £13 14s. 3d. per ton delivered at La Chapelle. The Northern of France Railway Company has given out an order for 14,000 tons of iron rails to the house of Wendel at £7 16s. per ton delivered at Laon, and another order for 6,000 tons of iron rails to the Denain and Anzin Company at £7 16s. 10d. per ton at the works. The demand for pig is active in Prussia, and there do not appear to be in any district any considerable stocks; the price of pig has not experienced any material change in Prussia, but merchants' iron shows a continually upward tendency. The Belgian coal trade presents rather less animation; in the Charleroi district, however, the demand for coal for industrial purposes is well maintained. The Belgian iron trade continues firm, and an advance is even contemplated in some descriptions of iron. A Belgian house has secured an order for ten locomotives on Russian account. The production of coal in France in 1865 is estimated at 12,600,000 tons. In 1859 the corresponding production was only 7,681,000 tons.

THE MANUFACTURE OF WATCHES AND CLOCKS,—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices, and no one should make a purchase without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends this pamphlet to any address on receipt of two postage stangs, and we cannot too strongly recommend it to the notice of the intending purchaser.—| ADVI. |

ELECTRIC TELEGRAPHY IRRESPECTIVE TELEGRAPHIC APPARATUS.

By Mr. E. G. BARTHOLOMEW.

(Continued from page 175.)

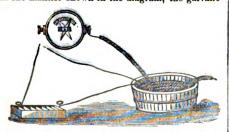
THE remarkable facts which have developed themselves in connection with submarine telegraphy, and which render it so interesting and important a branch of the subject, were first observed in connection with subterranean wires. In or about the year 1854, it was noticed that upon attempting to send a current through two wellinsulated buried wires between London and Manchester, the ends of which were united at Manchester, that an appreciable space of time elapsed between the transmission of the current into the one wire and its appearance at the other wire, provided the earth formed part of the circuit. That electricity should occupy an appreciable period in traversing 400 miles was a new fact; and, indeed, when two suspended or open wires of the same length were united in the same way, the time occupied in the passage of the current was, to all appearance, momentary; it could not there-fore be the distance which caused the delay. Again, if the buried wires were joined up so as to form a circuit wholly metallic, the earth being excluded, the same retardation did not occur.

The discovery of this fact, its evident importance in connection with submarine telegraphy, the imperfect state of our knowledge of the laws which govern the phenomenon, a consideration of the immense value of submarine lines of communication when completed, and the great pecuniary losses which had been incurred in futile attempts to lay cables up to 1861, was an ample justification for the appointment of a Royal Commission in that and the previous year to investigate the entire subject. Out of 11,364 miles of cable submerged up to that period, but little more than 3,000 miles

were in working order, or earning a revenue.

The same laws of R hold good with respect to submerged conductors as with suspended and it is not therefore necessary to repeat them here. Indeed, the law of induction also applies equally in each case, but the conditions necessary to its full development exist in so feeble a degree in the case of suspended wires, that it is not to be wondered at that the effects of induction in connection with telegraphy should altogether have escaped notice when no other form of telegraph existed.

It may be necessary to offer a few words of explanation upon this point. If a wire, covered throughout its entire length with an insulating material—say, gutta-percha—be suspended upon insulators in the same mauner as an ordinary open wire, it will present, upon the application of a battery pole, no features differing from those which an open wire would manifest under like conditions; but if the same covered wire be laid in water or moist earth, it is found that when the battery is applied in the manner shown in the diagram, the galvano-



meter will indicate that a momentary rush of electricity passes into the wire. This rush is electricity passes into the wire. This rush is called the "charge," and the wire is then said to be "charged." If the battery be now withdrawn, and an earth wire put in its place, the galvanometer indicates that another rush of electricity passes out of the wire into the earth. This second effect is called the "discharge." Now as no such phenomenon occurs when the insulating wrapper of the conductor is itself insulated, the inference is that the charge and discharge are dependent upon the combination of just two conditions—namely, that the wire shall be insulated, and the insulator not insulated. In another point of view we have the insulator—the dielectric—placed between two conductors, and in this lies the secret of the phenomenon.

A somewhat more familiar illustration will perhaps assist to make the point clear. If a common Leyden jar or a sheet of glass be coated upon each side within a short distance of its edge with metal foil, and a battery of high tension be applied, one pole to one side, and the other pole to the opposite side, the two surfaces of the glass acquire the same

tension as the battery poles, which the metal coating quickly distributes over the area it covers, and as the intervening glass is an exceedingly bad conductor-that is, interposes immense R sage of the current both over it and through itthese surfaces will retain their respective electrical states even after the battery is withdrawn, until connected together by a better conductor; and when they are so connected, the discharge of this tension passes through the conductor and becomes manifest upon a galvanometer placed in its circuit, the amount of the swing produced upon the needle indicating the amount of discharge. The amount of charge can be ascertained by inserting the galvanometer in the circuit of one of the battery poles. The proof that the charge is an effect entirely distinct from the constant flow of the current caused by any leakage in the dielectric is, that as soon as the surface is charged, the galvanometer needle will return to zero, although the battery contact is maintained.

It has been found by experiment that different dielectrics will take different amounts of charge and discharge; this amount is termed the "specific inductive capacity." It has also been "specific inductive capacity." It has also been found that the thickness of the dielectric has an influence upon the amount of induction.

To return to this subject as it affects cables, it will now be easy to trace the analogy. The copper wire is one conducting surface, the water or moist earth is the other, and the insulating wrapper is the dielectric. The surfaces of the conductors may be represented respectively in terms of the diameters of the copper and of the dielectric, and, combining all these conditions, we obtain the following formula, which represents the capacity of a unit of length of submerged and insulated conductor for charge, this being called its "electro-static capacity":

$$\frac{I}{2 \log \frac{D^{1}}{D}}$$

in which I is the specific inductive capacity of the dielectric, D, its diameter, and D the diameter of the conductor. It is obvious, however, that as surface has so much to do with the absolute capacity of a cable, the length of the conductor will exercise a material influence upon the actual amount of charge. This is gained by multiplying the result by the length.

It is natural to inquire what importance is to be attached to the amount of charge and discharge which a cable is capable of giving. The reply will be seen at once from the fact, that upon it depends the speed at which a cable is capable of transmitting signals—its speaking capacity. However large may be the electro-static capacity of a cable, the whole of the charge and discharge which enters and leaves must enter and leave it through the section of the conductor, and both these operations, when the charge is great, occupies an appreciable time. It would seem from this that by diminishing the resistance of the conductor, giving, that is to say, greater facility for the escape of the charge, you would diminish the time occupied. This is true, however, only up to a certain limit, for it must be remembered that by increasing the diameter of the conductor, you also increase its surface, and that in a higher ratio than the resistance diminishes. A reference to the formula shows that as D increases in value, the entire expression increases also.

The rate at which a cable can charge and dis-The rate at which a cable can charge and dis-charge itself is proportioned to the square of the length, other things being equal; and the speed of charging and discharging is, after all, only another mode of expressing the speed of working, because, before a second signal can enter the cable to be effective at the farther extremity, the first must be got rid of, unless every signal, and every interval between a signal, be exactly equal in duration; but as in practice this is unattainable duration; but as in practice this is unattainable, it is of the utmost importance that every means should be adopted to reduce the induction. startling, A single mile of No. 16 gauge wire presents a surface of 85.95 square feet, but even this does not represent the extent of inductive surface; and such a wire in a cables 1,000 miles in length contains almost exactly two acres of surface. Each of the present working Atlantic cables contains an area of conducting surface exceeding eight acres.

A consideration of the various dielectrics which

have been employed in the construction of submarine cables, either experimentally or in actual practice, will prove both interesting and

instructive. A large number of substance submitted to the Committee of Investigation of 1860-61, and a very careful and prolonged series of experiments were conducted, in order to of experiments were conducted, in order to ascertain their merits and demerits. whole of them, however, contained either guttapercha or india-rubber, either pure or in combination with some other material.

They were all subjected to the following tests:-Inductive capacity.

Insulation under changes of temperature.
Insulation under water pressure.

Absorption of water.

Effect of daylight.

Effect of exposure to the atmosphere.

The result of these experiments may be briefly

summed up as follows :-

The inductive capacity of caoutchouc is less than that of gutta-percha in the proportion of 8 to 10; its insulation or specific R is more than twenty times greater; it absorbs more water superficially, but the penetration of the water is not considerable. Both caoutchouc and guttapercha absorb from three to five times less seawater than fresh, and the salter the water the less it absorbs. The insulation of gutta-percha decreases under increased temperature much quicker than caoutchouc.

The quality of gutta-percha for telegraphic purposes has been greatly improved within the last few years. Its specific R has been nearly doubled since 1864, and the author has seen guttapercha which had been submerged in water at 100deg. Fah. exhibiting but little diminution of R.

In the construction of a submarine cable it is desirable, after having decided upon the core, to make the outer portion—the protecting covering of such a low specific gravity compared with its longitudinal strength, as that the completed cable shall be capable of supporting a very large excess of its own weight, when submerged in the deepest soundings in the proposed line of route. The wisdom of this precaution will be seen, when it is remembered that it is not always possible to lay a cable unintermittently. Many causes may and do continually arise for necessitating the stopping of the paying out, and when this occurs, the cable has sometimes to do the double duty of bearing all the strain due to its own weight, and also to hold on the ship. But more than this: if a fault has gone overboard, it is imperative not only to cease paying out, but actually to haul in perhaps some miles of what is already submerged. Every one knows or can understand the difference of strain upon a cable when being hauled in, and when being payed out. The narrative of the laying of the Atlantic cable of 1865 is worth the perusal of all who take any interest whatever in these matters. It will be found to contain much that is instructive as well as deeply interesting. (See "Macmillan's Magazine," for September, 1865.) The last two Atlantic cables—those of 1865-66, combined the essential characteristics of low specific gravity and high breaking strain in an eminent degree. The deepest soundings between Ireland and Newfoundland do not exceed 2,400 fathoms, or less than 21 nautical miles, yet these cables were calculated to bear eleven miles of their own length in water.

A comparison of the principal features in the old and new Atlantic cables may be instructive:
OLD CABLE (1858). NEW CABLE (1865). OLD CABLE (1858). NET CONDUCTOR.

A strand of 7 22-gauge A strand of 7 18-guage opper wires, weight copper wires, per knot, 107lb. copper wires, per knot, 300lb. weight

Three coats of gutta-percha, weight per knot, 261lb.

DIELECTRIC.

Tour coats of guttaltarnate with percha, alternate with Chatterton's compound, weight per knot, 400lb. PROTECTION.

EXTERNAL Eighteen strands of charcoal iron wire, each strand composed of 7 22½-gauge, laid over hemp saturated with tar.

Ten solid wires of homogeneous iron, No. 18 gauge, each wire covered separately with Manilla yarn saturated with preservative com-pound, the whole laid over jute yarn saturated with preservative compound.

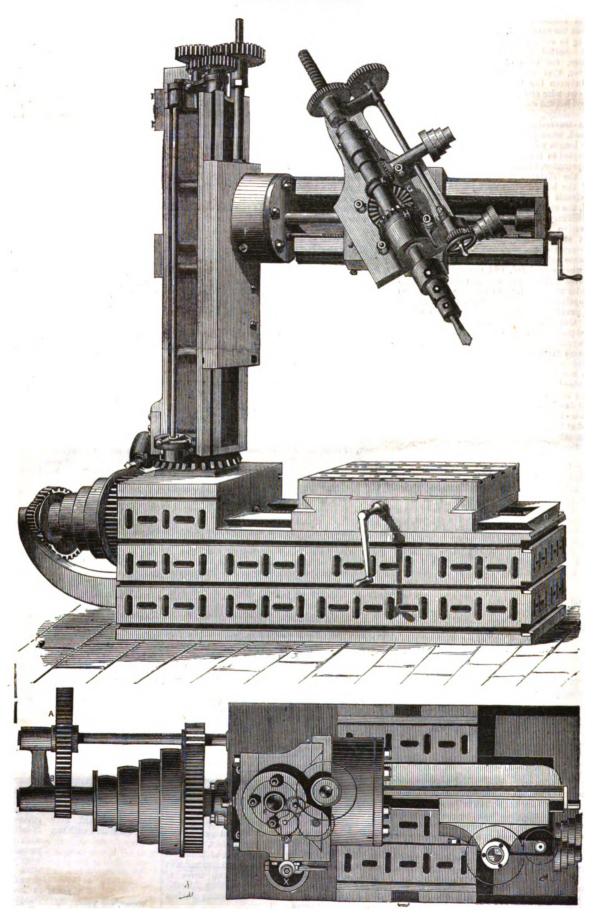
WEIGHT IN AIR.

20cwt. per knot. WEIGHT IN 35%cwt. per knot WATER. 13.4cwt. per knot. 14cwt. per knot. BREAKING STRAIN. 7 tons 15cwt S tons Sewt.

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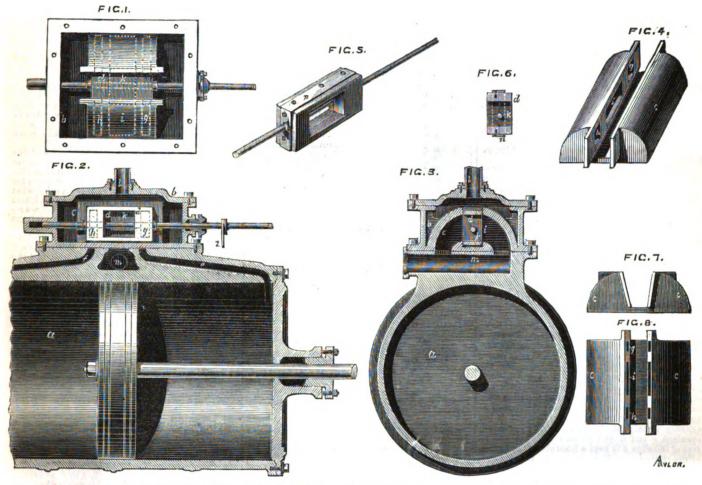
## ANGULAR RADIAL DRILLING: MACHINE.

BY MR. B. MILLER.



### EQUILIBRIUM SLIDE VALVE.

BY MR. J. E. OUTRIDGE.



In a few unimportant respects, the cable of 1866 differed from that of the previous year; its specific gravity was somewhat higher, but this was compensated for by its increased breaking strain. The advantages in the employment of a stranded conductor over a solid wire, when the metal employed is one to which a high test for longitudinal strength cannot be applied, as is the case with copper, is very apparent. If in a single wire a fault occur, or a bad joint be made, complete loss of continuity results from its yielding, whereas in a strand, care being taken that the several wires are never joined at the same spot, if any one wire gives way, others remain effective.

#### ANGULAR RADIAL DRILLING MACHINE.

THE machine illustrated in the annexed engraving, designed by Mr. Benjamin Miller, Sheaf Works, Leeds, is capable of drilling holes at any point on the surface of a hemisphere, as well as vertically and horizontally. The base consists of a hollow casting 7ft. by 3ft. by 2ft. 6in., provided with T-grooves and slot holes on its two sides and end for fixing the brackets or objects to be operated upon; it also carries a table with a transverse and longitudinal motion accomplished by screws; the taper is provided with T-grooves and slot holes on its top similar to the sides and ends. To the back end of the base is fixed a bracket for carrying the driving apparatus, consisting of a cone pulley and back gearing, in all respects the same as for a lather. To the base is fixed a pillar for carrying the jib and its connections; it is a hollow tube with three turned bearings, and is embraced by a frame provided with V's, on which the jib slides up and down and turns horizontally round the mast on the three bearings before named. The jib is capable of turning upon a centre bearing provided in the hollow shield cast on the sliding piece by means of a worm and worm wheel L, through an entire revolution, and can be fixed in any position by means of bolts in the circular T-groove in the shield. To the jib is attached a saddle capable of traversing to the extent of 3ft. along the jib by means of a screw and nut, in the usual manner. The drill headstock is attached to the saddle by

means of bolts in a circular T-groove, and is capable of being turned through and entire revolution if required and fixed in any desired position by the bolts in the T-groove. The tube surrounding the drill spindle has its lower bearing conical and capable of being adjusted to the greatest nicety by means of lock nuts and washers at its upper end; there is also a similar adjustment between spindle and feed screw, and between the nut and screw, the former being made in halves, thus insuring accuracy of speed.

Motion is conveyed to the drill spindle in the following manner:—On the end of the cone pulley shaft A is fixed a bevel pinion, gearing with a bevel wheel on the lower end of the shaft passing upwards and through the pillar and on its top end, carrying a spur wheel E, gearing into another spur wheel on a shaft sliding through its boss, and having its lower end in a bearing in the shield F, and carrying a bevel pinion, gearing into a bevel wheel, neither shown, on the end of the shaft passing to the outer end of the jib, on which shaft is the sliding bevel pinion, gearing with the bevel wheel, attached to the mitre wheel G, in the centre of the saddle and headstock, which latter wheel G gears with the mitre wheel H, on the tube surrounding the drill spindle, which latter is carried round with the tube by two sunk keys on either side, fitted into two long grooves in the spindle to allow of a rise and fall in the spindle.

allow of a rise and fall in the spindle.

The drill has a downward traverse of 15in. from the tube, and the self-acting movement is accomplished in the following manner:—On the tube is keyed the mitre wheel K, gearing with a similar wheel on the short shaft, on the opposite end of which is a cone pulley communicating motion to another cone pulley on the end of the worm shaft, the worm gearing with the worm wheel M, on the lower end of the vertical shaft; at the top end is a spar wheel, gearing with a spur wheel, on the nut which surrounds the feed screw, the said screw being prevented turning with the wheel by a key fitted to a groove cut in the threads of the screw, and attached to the drill headstock. The feed motion can be connected and disconnected at pleasure by means of the friction cone on the worm wheel shaft. The

jib is moved horizontally round the mast by means of a worm and wheel L attached to the lower end of the frame surrounding the pillar and retained in any desired position by means of set screws and buttons at the back of each bearing. The self-acting movement for raising and lowering the jib consists simply of a square-threaded screw, working in a nut attached to the sliding piece on the front of the frame. The screw is caused to revolve in opposite directions by means of connecting or disconnecting pinions with another carried on the top of the vertical shaft passing through the pillar. The wheels for this object are shown at O, and are thrown in and out of gear at pleasure by means of an eccentric attached to the top end of the vertical shaft passing from bottom to top of the frame; the eccentric attached to the top end of the frame; the eccentric scoupled to an arm carrying the wheels by a short link, by turning the handle X at the bottom of the shaft to the right or left, or at midway, so is the motion of the jib up, down, or stationary. Three notches are provided for the handle to fall into and lock at each of the three points.

The jib has a horizontal radial movement round the mast to work at opposite sides of the base or over a pit, at one or both sides, as desired, for acting upon large objects of unusual length; it has a vertical movement of 3ft., and the saddle has a horizontal traverse along the jib arms of the same extent, viz., from the centre of pillar to the centre of the drill spindle, 2ft. 9in. to 5ft. 9in., from the same centres when at the extreme end. The machine is capable of drilling, boring, and facing in any and all the positions of the jib or headstock, enabling it to work upon various descriptions of frames not otherwise accessible to ordinary tools; and, owing to its unusual strength of parts and weight of the castings, its action is smooth and steady.

#### EQUILIBRIUM SLIDE VALVE.

MR. JOSEPH E. OUTRIDGE, of 24, Hearnstreet, Newport, Isle of Wight, has recently patented an improved slide valve, which is illustrated in the annexed engravings. By his inven-

tion, the pressure of steam and vacuum is removed from the valves, and their free working is obtained without friction upon their faces. He accomplishes this by attaching to the ordinary valve box of a steam engine an apparatus consisting of one or more castings, each of which contains ports or passages for the inlet and outlet of the steam. The faces of the castings are opposite to, and fixed parallel to, each other. Between these faces a single or double slide is placed, each of which has an aperture in it whereby the communication from passage to passage is perfectly free. When a double slide is used, blades of brass or other metal are placed upon the parts of the slide exposed to the steam to prevent a passage beexposes to the stream of parts. Any necessary pressure upon the valve is provided for by means of a lever affixed to the slide rod; that part of the rod which holds the valve being flat, will keep the valve or valves to their faces.

Fig. 1 of our engraving is a top view of one of Fig. 1 of our engraving is a top view of one of these valves, the top cover of the valve box being removed. Fig. 2 is a longitudinal section, and fig. 3 a transverse section, of the valve applied to an ordinary steam cylinder. Fig. 4 is a perspective view of the casting before referred to. a is the cylinder, b the valve box, c the casting, and d the slide, which is single; ef are the two ports communicating between the valve box and the front and back of the cylinder. The casting c has two opposite faces, and is provided with a port or passage a in each face to communicate port or passage g in each face to communicate with the port e, and a port or passage h in each face to communicate with the port f. The casting is also formed with a central exhaust opening or port i corresponding with a similar opening k in the slide d; l is the steam supply pipe, and m the exhaust. In the forward movement of the valve the slide d passes the ports h in the casting, thereby allowing the steam to pass from the valve box through these ports h to the port f, and thence to the back end of the cylinder. The opening k of the slide also, in the forward movement, uncovers the ports g in the casting, allowing the steam in front of the cylinder to exhaust through the port e, ports g, openings & and i, and passage m. The bottom face of the slide d is kept a little above the bottom of the casting c, to allow the steam to flow between them. x is a lever on the slide rod; when pressure is put upon this lever, the flat part of the slide rod keeps the slides to their faces.

Fig. 5 is a perspective view, and fig. 6 a transverse section, showing a slide made double or in two parts, blades n of brass or other metal being placed around the slide to prevent steam passing between the two parts. Figs. 7 and 8 show one of the castings made with wedge-shaped faces or faces inclined to one another to receive a wedgeshaped valve and valves.

e understand that one of Mr. Outridge's valves has been at work on a locomotive engine on the Cowes and Nowport Railway since December 21 last, and has run 3,150 miles up to the present time, without any defect whatever, and continues to work well and satisfactorily. Another engine on the Ryde and Shanklin Railway, has just been fitted with one of these valves, and we expect to receive the particulars of the trial next week.

#### LONDON ASSOCIATION OF FOREMEN ENGINEERS.

ON Saturday, the 6th inst., the ordinary monthly meeting of members to meeting of members took place at the George Hotel, Aldermanbury, City, Mr. J. Newton, Royal Mint, president, in the chair. The sitting was principally devoted to business closely connected with the institution, and it was very numerously attended. After the confirmation of minutes of preceding meeting, the nomination and election of new members was proceeded with. These latter operations occupied a considerable portion of the evening, for never since the formation of the Association were the candidates for admission, on any one occasion, so numerous. Each election is ceded by a statement of the individual qualifications of the would-be associate, and then an open vote is taken; a majority of at least two-thirds of

Post Office; George Robertson, of Leadenhall-street; and Thomas Hall, of Bouverie-street.
Mr. William Thorburn, general foreman to Messrs. David Napier and Sons, Yorld-road, Lambeth, was elected an ordinary member; and Messrs. T. Hughes, J. F. Wolff, J. E. Reed, H. Noble, R. Wood, and J. Bates, were nominated in the same

category.

It now seems evident that employers and em ployed are alike interested in the progress of the Association, and equally determined to promote its Under such circumstances, the institution cannot fail to increase in influence and importance, and that to an extent as yet scarcely calculable. In view of this prosperous state of affairs, it was unanimously resolved that the local habita tion of the society should thenceforth be transferred to more commodious quarters, namely, the City Terminus Hotel, and where its future sittings will therefore be held. It was also announced that Professor Tyndall would, in all probability, deliver an inaugural and scientific lecture before the associated foremen, at their new rooms, on the evening of Saturday, April 3 next. Arrangements having been made for announcing, week by week, in the advertisement columns of the "Engineer" and the MECHANICS' MAGAZINE, the special qualifications for posts in engineering establishments, of such associates as may be unemployed, and some minor business disposed of, the meeting of last week was brought to a conclusion.

N XYLOGRAPHY, OR PRINTING AND GRAINING FROM THE NATURAL SURFACES OF WOOD.

By Mr. William Dean, Sen. (Concluded from page 179).

SHALL deal with the question of cost as I have I SHALL deal with the question of cost as I have dealt with the question of quality, and point out what has been done under the patent in a given time. I may, however, remark here, that there are plenty of painters, in London and the country, who say that they can get graining done at 5d, and 6d, pr yard. I do not deny the statement, for I heard one gentleman say that the men who did his graining got through a great deal of work, for they did it with whitewash brushes, and for aught he knew (or berhaps cared), it answered as well as if it were whitewash brushes, and for aught he knew (or perhaps cared), it answered as well as if it were more costly. There are others, however, who are candid enough to admit that for good oak-graining they have often to pay 2s. and 2s. 6d. per yard. Among the latter, I have pleasure in mentioning Mr. Foxley, of London. I have it on the authority of Mr. Crossley, of Newark, that he paid to a London grainer £50 for graining fifty doors for him, in a house he was decorating in the metropolis for, I believe, a Nottinghamshire gentleman; but Mr. Crossley declined to affirm that the hand-graining he paid so high a price for was equal in quality to my specimens. cimens.

A painter in Burslem was anxious to see some A painter in Burslem was anxious to see some work done by the process in his own house; a man and boy were sent over to do some, and they grained two six-panelled doors in twenty minutes by the clock. The wife of the painter told me she watched the clock with the special object of ascertaining how long it took to do them. The same man and boy grained an octagon pulpit for another painter, about three miles from Burslem, in an hour and twenty minutes. Both these painters purchased licenses. When Messrs. Simmons and Son, of Mauchester, purchased a second machine, I gave one of their men instructions in working the process, and after three days practice, I asked him, about the quantity of work he could do as compared with hand graining, and he informed me that he was quite sure he could do one ne could do as compared with nang graining, and ne informed me that he was quite sure he could do one-third more than by hand, and much more easily and pleasantly to himself. At the North Staffordshire Railway Company's works, when giving instruction to their foreman, I myself grained ten square yards of imitation East India teak in two hours by the watch, and this was done in the same compartments with and this was done in the same compartments with solid teak, and had to match it. I had a young man to assist me, such as the hand grainer has to rub his colour in for him.

colour in for him.

Perhaps, after all, the most conclusive illustration of success in price is supplied by its application to japanned goods. You are all probably aware that the graining on that class of goods is of the best kind. In Wolverhampton, I was told by the leading manufacturers, that successful competition in price with hand graining on their goods was out of the question. From that conclusion, however, I dissented, and I told them so. From Wolverhampton I went those present being required to secure admission. The following gentlemen were unanimously elected as honorary members:—Messrs. George Waller, of the firm of Burton, Sons, and Waller, Holland-street, Blackfriars-road; Edward R. Allfrey, of the firm of Messrs. Humphrys and Tennant, Deptford; Richard Moreland, sen., of the firm of Messrs. Humphrys and Tennant, Deptford; Richard Moreland, sen., of the firm of Messrs. Humphrys and Tennant, Tene I met a gentleman from London, unconnected with the japanning trade, who bought the exclusive licence for that class of goods to British and Sons, of Granville-street, for a price which left him a very handsome profit. I need not hesitate to affirm that if the process will compete successfully in price with hand graining on japanned goods, it will compete in price with any street; Frank Ives Scudamore, Secretary General

not have given the price they did for an exclusive licence if they had not satisfied themselves on that point. Fourteen months ago, I supplied them with one machine, and set them to work, and in about six months after, they wrote to me to forward them two more machines.

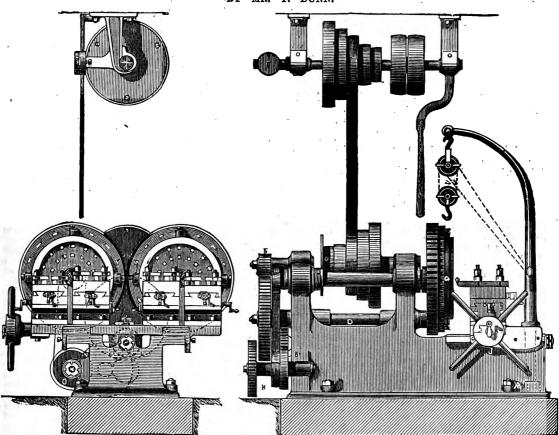
more machines.

The question of durability has been raised, and properly so, as that is a point of great importance to the public. To enable you to judge, I may say that the hand-grainer works in distemper, I in oil colours; and it resolves itself into the old question, which is the more durable, water colours or oil colours? After all, the test of experience is the most constant of the colours of the colours of the colours of the colours. After all, the test of experience is the most conclusive and matisfactory; and here again I must refer to my specimens, as the large one has been done more than three years, and has had a good deal of knocking about at exhibitions, and travelling through the country. If a good sound varnish is used, I have no hesitation in saying that the work will be very durable, and much more so than work done by hard.

done by hand. In applying the subject to the exigencies of our condition as a commercial country, shall I be far from the truth if I hazard the remark that in this department of our operations there is great room for improvement? I am supported in this view by what occurred in a conversation I had with an architect in the provinces. Substantially, it was as follows:—I said to him, "The painters and decorators tell me I said to him, "The painters and decorators tell me that graining is going out; that architects will not have it, and are either staining the plain deal, or using parti-colours instead in their decorations." He replied, "To some extent that is true, and the chief reason is, not so much that they object to graining in the abstract, as that they object to the kind of graining they have done for them. They would only be too delighted to have it done as good as your samples, for these are beautiful and true to nature." Now, God has implanted in the hum mind a love of the beautiful and the true; hence t kind of graining they have done for them. They would only be too delighted to have it done as good as your samples, for these are beautiful and true to nature." Now, God has implanted in the hum mind a love of the beautiful and the true; hence t merchant hastens away, and, amid the beauties nature, forgets for the time the cares and anxietie of the counting-house and the exchange, and the artizan the toils of the workshop; each rejoices in beholding the loveliness of the landscape, and contemplates with delight the gorgeous and varied verdure of the trees; but how few there are who reflect and pender on the marvellous internal structure of those trees which grow in our woods and hedgerows, so full of elaborate ornament, feathered, flowered, striated, and dotted, in patterns of perfect, and sometimes of complex beauty, to an extent that no graving done with the graver's tool can equal in gracefulness of design or in strength and delicacy of touch, Hitherto, these patterns of wondrous beauty have been imitated by the cunning hand of man with his pencil or his graver; but this process will inaugurate a new era, and these exquisitely beautiful patterns will be reprodueed in almost endless variety. The letter-press printer reproduces old and scarce books, and the chromo-lith-grapher reproduces rare and costly pictures, and this at a price that places them within the reach and means of the general public. So this process is designed to make accessible to the community in general copies of the more than artistic beauties of a part, though it be but a small part, of the glorious works of God. I flatter myseli that I can, even at this early stage of the process, produce as fine a copy of achoice piece of Baltic billet oak, as the chromolithographer can produce of Stanfield's "Venice," Turner's "Polyphemus," or any other fine work of art. In conclusion, will you permit me to say that in dealing with the subject under consideration, I have, to a large extent, kept my own opinion of its merits in abeyance; I have asserted success; that nothing but the sternest necessity has prevented Mr. William Simmons from being present this evening. A better testimony to its practical value it would be difficult for me to give yon. To that firm I have great pleasure in thus publicly expressing my indebtedness, for they not only lent me a helping hand when help was of more value to me than it is to-day, but they readily permitted me to refer to them, and gave themselves the additional trouble of taking persons in the trade from other towns to see the work they had done under the patent.

### DUPLEX TIRE LATHE.

BY MR. T. DUNN.



DUPLEX TIRE LATHE

DUPLEX TIRE LATHE.

ABOVE we give a side and an end elevation of a duplex tire lathe, with two or four tools working simultaneously, the invention of Mr. T. Dunn. a is the bed, to which are cast or fixed the bearings a 1 for the driving spindles b and c, and for the centre spindle on which the speed pulleys are fixed. To one end of the centre spindle is fixed a pinion gearing into the wheel fixed to one end of the shaft, to the other end of which is fixed a pinion, gearing into the teeth on the circumference of the face plate C; the other face plate is driven from the face plate C, as shown. The four slide rests are all mounted on the cross bed, which is traversed along the bed a by the screw in the following manner:—To the spindle b are fixed the speed pulley, driving by a strap the pulleys o; to following manner:—To the spindle b are fixed the speed pulley, driving by a strap the pulleys o; to these pulleys is fixed the pinion, gearing into the wheel fixed to the same shaft as the pinion gearing into the wheel, which drives the wheel on the end of the screw. This screw gears into two worm wheels, as shown; the upper of these worm wheels is fixed to the shaft of the spoke wheel or cross handle, and the lower one is fixed to a short shaft which is driven by means of the spur wheels. The shafts of the worm wheels revolve in hearings shafts of the worm wheels revolve in bearings fixed to the cross bed. When the screw is moving the slide rests, the worm wheels act as a screw nut, but when it is desirable to move the slide rests by hand the tightening handle is slackened; and on then turning the spoke wheel the worm wheels act as a single and the savent height streams and the savent height streams. as pinions, and the screw being stationary acts as a rack. It is evident that the tool of each slide rest can be moved independently of the others; consequently, two of the tools can be made to bore out the tires or other articles, and the other two to turn up the exteriors. The bed a and the beds of the sile of the other lathes can be made with a socket for the jib crane p, which supports a pair of blocks for lifting the tires and other articles into and out of place.

## MANCHESTER STEAM USERS' ASSOCIATION.

ON Tuesday last the annual meeting of the above Association, which has hitherto been known as the Association for the prevention of steam boiler explosions, was held at the Town Hall, Manchester, Dr. Fairbairn, President of the Association, in the chair. Mr. R. Tonge, the secretary,

read the report for the past year, the details of which have for the most part appeared in our columns from time to time. It is, therefore, only necessary here to refer to the satisfactory position of the Association, and to the resolutions passed at the meeting. The number of members of the the meeting. Association on the 31st of December last was 573; works, 747; boilers under inspection, 1,930; subscription, special service fees, &c., £3,944. The revenue of the Association for the past year has revenue of the Association for the past year has attained to a higher point than during any previous one, and there is a balance in favour of the year's working of £305. The reserved fund is increased by this sum, the amount of that fund now being £2,797, which, added to the guarantee of £13,000, makes the total value of the guarantee fund on the 31st of December, 1868, £15,797. The number of corresponding members of the Association has again increased during the year. There were, on the 31st of December, fifty members of this class. again increased during the year. There were, on the 31st of December, fifty members of this class, forty-two being resident in the United Kingdom, one in Naples, one in Switzerland, one in Dresden, Saxony, one in Vienna, two in Calcutta, one in New York, and one in Amsterdam. There were fifty-nine boilers more under inspection at the close of 1868 than there were at the close of 1869, and a greater number upon the books of the Association on the former date than ever before.

Some highly practical remarks were made by the chairman upon the general subject of steam, in the course of which he observed that experiments were in progress to prove the efficiency of high attenuated steam, worked at pressures vary-ing from 180lb. to 200lb. down to that of the ing from 1801b. to 2001b. down to that of the atmosphere, and ultimately condensed. After this Mr. R. H. Greg, of Stockport, moved the next resolution:—"That the name of this Association be modified, and instead of remaining as at present 'The Association for the Prevention of Steam Boiler Explosions, and for the Attainment of Economy in the Use of Steam,' that it be henceforward 'The Manchester Steam Users' Association for the Prevention of Steam Boiler Explosions.

arousing public attention to the present unsatisfactory character of the investigations conducted by coroners regarding the cause of steam boiler explosions, as well as to the erroneous verdicts constantly returned, and requests the committee of management to take such further steps as they may find necessary to secure these investigations being rendered more satisfactory, so that the truth may be fully arrived at, and plainly spoken in each may be fully arrived at, and plainly spoken in each case, in order to prevent the constant recurrence of these fatal catastrophes." He believed that under a more rigorous system of inquiry into the so-called accidents, employers would be compelled to be much more careful, and the result would be an immense saving of human life. Mr. C. J. Pooley, in seconding the resolution, pointed out how, on scientific grounds, these inquiries should be conducted in a more complete manner than at present. Mr. W. Richardson, of Oldham, supported the resolution, which was carried.

the resolution, which was carried.

Mr. S. Rigby, of Warrington, moved:—"That
the benefits derived from membership with this Association are not confined to questions of safety merely, but embrace others of importance to steam users, such as the prevention of smoke, the steam users, such as the prevention of smoke, the best construction and equipment of boilers, &c." Mr. Cowell, of Patricroft, seconded the resolution, which was adopted. Thanks were voted to the officers of the Association for their services during the year, and those for the ensuing year were relected or appointed; and the proceedings terminated with a special vote of thanks to the chairman for presiding at the meeting, as well as for his interest in, and constant service to, the Association. Association.

## HEAVY PUMPS WORKING IN A SLOPE OF 1 IN 4.

Boiler Explosions, and for the Attainment of Economy in the Use of Steam,' that it be henceforward 'The Manchester Steam Users' Association, for the Prevention of Steam Boiler Explosions, and for the Attainment of Economy in the Application of Steam,' so that it may be cited in brief as 'The Manchester Steam Users' Association.'" Mr. Jabez Johnson, of Bolton, seconded the motion, which was carried nem. com.

Mr. Thomas Schofield, of Cornbrook, moved:—
"That this meeting hears with satisfaction that steps have been taken during the past year for

increased length of the column, the resistance due to riction is greater than if the pumps worked in a vertical shaft; but this is fully compensated for by the adva tage afforded for a larger ratio of expanthe adva stage afforded for a larger ratio of expansion, in virtue of the increased momentum from thadditional length and weight of pump-rads put in motion each stroke, and the work was specially designed by Mr. Morgan Morgans, of Bristol, to secure this advantage. It is important to find that pumps can be made to answer well in this manner, and it was once proposed to sink a shaft at this colliery purposely to avoid the disadvantages which were thought to be inseparable from slope pumps, but the chief of which have been, in this case, entirely overcome by Mr. Morgans, whose experience in draining mines is well known.

## THE GOVERNMENT MEMORANDUM TO INVENTORS.

THE relations subsisting between inventors and various branches of the Government, needing and using the intelligence of inventors, has long constituted a topic of painful comment and incrimination. The War and Admiralty departments have so often been made fields of conflict between the advocates of two widely divergent and conflicting opinions, that, speaking on behalf of inventors generally, no less than of the Government, we would gladly hear of some equitable basis of agreement come to, whereby the two antagonistic parties might be satisfied. In considering this matter, the first question to suggestitelf is, why should there be any antagonism? Either the governmental departments—especially the War Office and Admiralty—are independent of extraneous inventive aid, or they are not. If they are, then the practice would be comprehensible of looking upon inventors as a troublesome lot, of repelling their advances, giving them curtly and sumlooking upon inventors as a troublesome lot, of repelling their advances, giving them curtly and summarily to understand that the State is in no need of them, and will neither treat with them, nor countenance them in any way. If, on the other hand, they are wanted—if Government departments feel themselves under the need of using extraneous inventions from time to time, then one of two courses is open: either give inventors to understand that the Government, being strong, will take what it likes, paying no equivalent, or else assess the fitting remuneration by some tribunal impartially constituted naving it either give inventors to understand that the Government, being strong, will take what it likes, paying no equivalent, or else assess the fitting remuneration by some tribunal impartially constituted, paying it promptly and without demur. In matters of disputed value and rate of remuneration generally, the practical worth of a thing is what the owner could exact payment in respect of before the tribunal of the law; but the fact cannot be too prominently borne in mind that, as between the British Government and inventors whose inventions are adopted by the Government, a flat of outlawry went forth in the verdict of the cause "Feather v. the Queen." British law regards every inventor as an outlaw; as a man having no legal rights in any matter relative to the use of his invention by the Government. It would be an insult to the reader's intelligence were we to debate the moral right and wrong of this decree. We only state what is the law, expressing at the same time our conviction that public opinion would never second or sanction the strict upholding of this, in any case of undisputed use and adoption by a governmental department of an invention originating with a member of the public. Not wishing to overrate the grievances inventors have complained of in the course of their dealings with the Government, we are free to admit, that although the legal ruling is precisely as we have stated, yet the cases of inventors whose inventions have been adopted by the Government remaining totally unrewarded are comparatively few. Usually, some bonus has been conceded, but the manner of this assessment and award has been hitherto most unsatisfactory. Government in these manters has acted as though prompted by the desire to give an inventor the very maximum of trouble; to tire him out by all sorts of unnecessary delay, whereby in time his hopes and aspirations might be lowered to a convenient despair for inducing him to accept a trifle. The statement has often gone forth, in these columns as well as elsewhere—it is one, moreover, adjudication of reward to inventors devolved on the legal heads of departments, who were allowed a percentage commission on any abatement they might succeed in effecting. Nothing could be more unfair than this; few arrangements more prejudical both to inventors and the Government can be assumed. Indications, we are gratified to state, are not wanting that Mr. Gladstone's administration is not insensible to the past injustice to which we have referred, and is resolved that inventors coming before governmental departments, and having their inventions ultimately adopted. shall be equitably treated in future. The first indication is seen in the terms of a recent memorial announcement issued from the War Office, for the consideration of inventors, whereby various checks are imposed to the suppression of a valuable invention; first, establishing a more fairly const tuted tribunal than heretofore for the assessment of value; secondly, defining the mode of payment and indication is a second to the suppression of a valuable invention; first, establishing a more fairly const tuted tribunal than heretofore for the assessment of value; secondly, defining the mode of payment and indication is a second indication. ment of value; secondly, defining the mode of pay-ment, and indicating the precise time. In former days, if a man possessed an invention bearing upon

warlike art, and wished to treat on behalf of the same with the Government, his usual course of pro-ceeding was the following. He made application either to the War Office, the Ordnanace Select Comceeding was the following. He made application either to the War Office, the Ordnanace Select Committee, or the Admiralty. His letter of communication met a prompt response, accompanied with a printed statement of the terms on which alone the Government would condescend to treat with him. He must defray all expenses: he must disclose all particulars; flually, he must trust wholly and absolutely to Government for reward in the event of ultimate adoption. Now, the common opinion is (and it is one that, conscientiously, having arrived at belief through evidence within our own knowledge, we cannot gainsay) that, on many occasions, inventive particulars thus communicated to the War and Admiralty departments have been turned to unfair account: that, by some means or other, those particulars have become known to members of the public service, "improved," ostensibly, at least, into discoveries of their own, to their sole advantage. If this did not happen, it readily might have happened. So powerful an incentive to profitably unfair dealing, without much chance of discovery, should never have been permitted. By the terms and wording of the memorandum, we are glad to see a check imposed on this contigency of unfair dealing. Inventors now regiven to understand that their communications are not to be addressed to either of the War Departments but contigency of unfair dealing. Inventors now regiven to understand that their communications are not to be addressed to either of the War Departments, but to one of the Under Secretaries of State, who takes upon hinself the responsibility of laying them before the War Department, where due consideration is pledged. The Government do not hold themselves responsible for any expenses an inventor may have incurred in the inceptive stages of an invention, but expresses readiness, under certain circumstances, to contribute towards expenses necessary to the developincurred in the inceptive stages of an invention, our expresses readiness, under certain circumstances, to contribute towards expenses necessary to the development of an invention. The next point of importance in the recent memorandum is relative to the tribunal of assessment, which is to be a committee held in the War Office, a great improvement on the old mode of leaving this matter to the discretion of the legal heads of departments. Whether or not any civilian element is contemplated in these War Office committees of adjudication the memorandum does not state; but if not, the machinery will be needlessly defective. Lastly, as regards time and mode of payment in behalf of inventions deemed worthy of acceptance and adopted, these matters—so important to ance and adopted, these matters—so important to inventors—are by the memorandum clearly defined. As soon as the value of an accepted invention has inventors—are by the memorandum clearly defined. As soon as the value of an accepted invention has been assessed, the sum—under sanction of the Secretary of State—is to be inserted in the estimates, when, on being passed by the House (but not till then) the inventor will receive his award. The new regime may be said to have found its first application in the award to Captain Moncrieff; for, although Government had come to a conclusion in respect to this matter before the memorandum to which we have been referring was issued, yet the spirit of it is clearly seen in the terms and manner of Captain Moncrieff's award. Altogether, the aggregate sum receivable from the Government by this gentleman may be set down as some £20,000. After paying him for the expenses of drawings, models, &c.—a concession rather in advance, by the way, of the terms of the new convention—he is to have £10,000 on the passing of estimates, and £5,000 more at the date when his assistance may be no longer required by Government in further developing his system. He is to be paid £1,000 per year for such time as he has been already assisting the Government, and for all future time until his services are no longer required. Then he is to receive £5,000. Altogether, this is an arrangement more liberal—as we have already said—than the new memorandum strictly required. Then he is to receive £0,000. Altograms, this is an arrangement more liberal—as we have already said—than the new memorandum, strictly would warrant inventors to expect. All already said—than the new memorandum, strictly interpreted, would warrant inventors to expect. All the better, is what we say; and if this liberality of treatment is to be repeated, all the better still. The English public, we are right sure, will never uphold unfairness by the Government to inventors who have advanced the interests or increased the power of any public department.—"The Engineer."

# PROPOSED NEW WORKS AND MACHINERY FOR THE NAVY.

FOR THE NAVY.

THE new estimates under this head provide for an expenditure of £749,816, which is a decrease of £64,421 on that of the previous year. The principal items of expenditure are at Chatham, where there is to be an increase of £39,485 in a total of £269,190; and at Portsmouth, where the expenditure under this head is proposed to be £264,630. For new works and naval establishments abroad the proposed sum is £59,217, showing a reduction of £51,862. The extension of Chatham Yard, which was originally estimated to cost £4,250,000, and on which £672,607 has been already expended, has a sum of £285,000 appropriated to it. For the extension of Portsmouth Dockyard, which was first estimated at £1,508,000, and on which £389,828 has been expended, the sum to be voted in the present year is £279,284. In the works abroad are included a vote for the extension of the mole at Gibraltar of £4,000, this was originally estimated to cost £122,500, and has cost up to the present time £88,149. At Malta an expenditure is proposed

of £30,000 towards the construction of a dock, wharves, &c., which were originally estimated to cost £195,000, and on which £81.225 has already been spent. In the item of machinery, under the whole vote for the works, there is a total decrease of £26.211.

REGISTERING THE FORCE AND DIRECTION OF THE WIND.\*

By Mr. Thomas Mackereth, F.R.A.S., F.M.S.

HAVE for a long time been wishful to obtain a simple instrument by which I could record, in a satisfactory manner, the exact force and direction of the wind. I am aware that records are made by Osler's anemometer, but I have many objections to it. The first is, that its mode of recording the exact degree of the compass whence each pressure of the wind has come is so cramped, that it is impossible to determine such a degree from the record. The second objection is that it is impossible from its record to determine the mean direction of the wind for any given time. The third is that its system of machinery appears so complicated as, in my opinion, to leave doubt whether its records are reliable. The immense pressures it is said to have recorded at Liverpool, for instance, are, in my estimation, very questionable. Then the great cost of the instrument, and its requiring an ordinary building to be adapted for its use, must preclude its employment by the many meteorological observers we have in the country

Up to the time of the great storms which occurred on February 22 and March & last year, I had a pressure anemometer which was made and kindly given to me by my friend William Oxley, Esq. That this instrument recorded the exact pressures of the wind, I have abundant testimony. The greatest pressures of the storms I have mentioned was 321b, on the square foot. That was the highest pressure the instrument was capable of recording, and I believe, from other pressures which I witnessed during the same storms, that if the instru-ment could have recorded a higher pressure, especially on February 22, it would not have reached above 40lb. on the square foot. But it is reported that during the storm of February 22, a pressure was at Liverpool of more than 70lb. on the square foot; and on December 27, 80lb. on the square foot was recorded. I confess it is with difficulty that I receive such a report. Probably the height at which the Liverpool instrument is placed may

which the Invertool instrument is placed may give some value to the record.

Whilst I was arranging with Mr. W. Oxley for an instrument that would record higher pressures, I met with a description of an anemometer in the "Proceedings" of the Meteorological Society, vol. 4, page 161. My first objection was to the fcllowing statement respecting the pressure of the wind in this country:—"The greatest pressure here provided for is 20lb. on the square foot, which is sufficient for the winds that occur in this country, as proved by careful experiment." Cercountry, as proved by careful experiment." Certainly such a statement is very far at variance with the records that are said to have been made at Liverpoel, or even at Greenwich. However, I and Mr. Oxley gave the instrument a careful consideration, and at length abandoned it as a means of recording such high pressures as we were sure had been recorded. Besides this, its mode of recording the directions whence the high pressures come is far too complicated and confusing. I at length suggested that Mr. Oxley's own an emometer length suggested that Mr. Oxley's own anemometer could be made to accomplish all that this instrument professes to do, and in a much more effectual manner. But no sooner were my ideas thrown out, than my friend's mechanical skill accomplished what was wanted in the simple manner in which it now exists.

This instrument does not profess to record the This instrument does not profess to record the time when the pressures occur, though an arrangement could easily be adapted for this purpose. In this respect alone is it inferior to Osler's anemometer. But as every observer of the wind is furnished with Mr. Robinson's anemometer, the hourly records of this instrument would afford the means of a ready estimate of the time when the means of a ready estimate of the time when the heaviest pressures occur. By means of Mr. Oxley's anemometer, I am able to record the variations of the wind for twenty-four hours, the exact degree of the compass whence each pressure comes, and, from the daily curve, to reduce in a most satisfactory manner the mean direction and range of the wind, as well as the mean direction of the heaviest pressures. I consider it of the greatest importance to trace out the exact point of the

\* Manchester Literary and Philosophical Society.

compass whence every great pressure comes. Ιf this were done at all our stations in this country, it would tend to a better understanding of the course storms take, and of the connection between the fall of rain and the direction of the wind.

STEAM SHIPBUILDING ON THE CLYDE

MESSRS. R. DUNCAN and Co., of Port Glasgow LESSRS. R. DUNCAN and Co., of Fort Glasgow, have contracted to build a screw of 1,000 tons for Mr. R. Little, of Greenock. Messrs. Randolph, Elder, and Co., have launched the "Patagonia," a vessel of 3,000 tons burden, builder's Randolph, Elder, and Co., have launched the "Patagonia," a vessel of 3,000 tons burden, builder's measurement, and 600-horse power nominal. The "Patagonia" has been built to the order of the Pacific Steam Navigation Company, and is a sister ship to the "Magellan," lately launched by Messrs. Randolph, Elder, and Co.; she is intended for the company's direct mail line between Liverpool and Valparaiso. Her engines, which are being supplied by Messrs. Randolph, Elder, and Co., are constructed upon their patent compound principle. Messrs. R. Duncan and Co., of Port Glasgow, have launched an iron screw named the "Cambria" of the following dimensions:—Length, 315ft.; breadth, 85ft.; depth, 22ft. 6in.; burden, 2,000 tons. The "Cambria" will form one of the Anchor Line from Glasgow to New York. Messrs. W. Hamilton and Co. have launched from their yard at Port Glasgow a paddle named the "Osmanby," built for the Ottoman Government. The "Osmanby," which is a strongly-built wooden steamer, is of the following dimensions:—Length, 178ft.; breadth, 21ft.; depth, 10ft.; and burden, 370 tons.

#### AERIAL NAVIGATION.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,-Permit me to draw your attention to a new system of aerial navigation, as represented in the enclosed photograph, and which is the invention of myself and Mr. J. Lassie. The aerial vessel is of nived and Mr. J. Lassie. The serial vessel is of sufficient capacity to contain a volume of gas suffi-cient to lift and carry up the whole apparatus, At summent capacity to contain a volume of gas sufficient to lift and carry up the whole apparatus. At the same time, it has the most perfect form for progressive motion, and also possesses propelling force so that it may be driven and steered in any direction. An arrangement is made for varying the ballast at pleasure, so that the aerial ship can be made to ascend, descend, or remain stationary without any loss of the gas by which it has been raised.

The most appropriate construction for an aerial ship, so that steerage may be practicable, is an iron or



an aluminium cylinder, whose length is at least ten times its diameter. The lifting power is obtained from hydrogen gas, the necessary quantity of which is stored in a receiver, which is provided within the vessel, and is so constructed that equal volumes of gas always act upon equal lengths of the axis. This cylinder is surrounded for its whole length by three spiral flanges or wings of about one-sixth part of the cylinder, each spiral flange making about two turns in the whole length, so as to look like a scrow whose ends are either conical or hemispherical.

In a vessel so constructed, it will be evident that if a rotary motion be given to the cylinder it must advance in the direction of its axis, with a velocity proportioned to the velocity of rotation; in other words, the screw will move forward in proportion to the rapidity with which it is made to revolve, and also in proportion to the developed surfaces of the spirals. Within the outer or main cylinder is a second cylinder of less diameter, and connected with the first by a system of metallic tubes and wire supports. The space is closed at the ends, and is capable of holding the requisite quantity of gas, and also a series of air bags or chests to be presently described. This inner cylinder may be called the tunnel. It is the hold or cabin of the aerial ship, and is divided into compartments of 6ft. in width. In each of these compartments is a hammock, movable about the axis. The floor of each cabin is and is divided into compartments of 6ft. in width. In each of these compartments is a hammock, movable about the axis. The floor of each cabin is divided into steps like those of a tread-wheel, on which men working make the screw revolve about its axis, and thus propel the ship through the air, so that the walk of the men in the tunnel is proportioned to the travel of the screw ship as 1 = 18 × 3 flanges or, if the men walk one mile, the vessel will advance eighteen miles, and that in twenty minutes. This motion of progression being obtained, there is no difficulty in steering the vessel, which is effected by a smaller vessel—the length of which is about twice its diameter—attached to end of the ship, which performs the office of a rudder in the same manner as those of ships, and with like effect. This balloon rudder answers to the revolving motion, and is able to carry a great weight, and may be of utility for ebservations. It will also form the recond of the captain, who will be in immediate correspondence

captain, who will be in immediate correspondence with every cabin, either by electric wires or any other method of signalling.

The means of support or flotation and progression being thus obtained, we have next to provide a method of ballasting which is variable at pleasure, and by means of which the ship may be made either lighter or heavier, or of equal weight and density with the air in which it floats, thus enabling the navigator to alter or maintain any altitude which may be suitable to his purposes without any loss of gas on which he relies for the support or lifting power of his ship. To this end I propose the air for ballast, the density and weight being regulated by an apparatus as follows:—In the gas chamber are placed a series of oiled silk sacks, one opposite to each of the compartments into which the tunnel is divided. One end of each of these sacks opens by a valve under the steps upon which the men tread in producing the motion which propels the vessel. Each of these steps is arranged as a bellows, by means of which, at every step, air is forced into the sacks until the requisite weight is obtained for ballast. The other end of these sacks opens outward by another selfacting valve, each of these valves being under the control of the navigator. By this arrangement, the ballast of the ship may be increased or diminished at will. It will be seen that this construction also avoids all danger of explosion or collapse from any rapid change of temperature occurring in the journey.

The leading features of this new aerial ship are—that its density may be varied at will without loss of gas; its horizontal stability is perfect with every degree of the barometer; if inclined, the inclination will take place gradually and at will. I am prepared to prove the mathematical correctness of this principle and the safety of the vessel and crew.—I am, Sir, yours, &c.,

26, Grove-place, Brompton-road, March 8.

Sir, yours, &c., G. SEN 26, Grove-place, Brompton-road, March 8.

#### EXPLOSIVE COMPOUNDS.

EXPLOSIVE COMPOUNDS.

Sir.—I have but one recommendation for all objectors to white gunpowder, and that is, that they make a small sample and try it themselves, an operation they can easily perform in the space of ten minutes, as I have repeatedly published the process. I beg, however, to observe, in regard to the remarks of your anonymous correspondent "F. W. R." that the blowing out of unconsumed grains, which may be seen, without "superhuman oyesight," at any rife practice, was noticed, at least as far back as the year 1742, by the artillerist Benjamin Robins, who first made use of the ballistic pendulum for investigating the velocity of projectiles. Quick burning gunpowder is objected to by "F. W. R." and all gunmakers on the authority of Sir W. Armstrong, but that gentleman is no authority for me, for he had the description of the manufacture of wrought-iron coil guns, first published by me, in his own hands four years tion of the manufacture of wrought-iron coil guns, first published by me, in his own hands four years before the date of the so-called Armstrong patent for the same construction. It is absurd to contend that the slower the shot is driven out of the muzzle, the longer the range and the deeper the penetration; whereas, I or any one else can prove the contrary, by actual experiment, in the course of five minutes. The objections to quick burning powder arise solely from the defective construction of our guns, which have no solid block of metal behind the bottom of the chamber, and consequently such guns cannot stand the concussion caused by the explosion of powerful powder.

the concussion caused by the explosion of powerful powder.

The fact is, that white gunpowder, or any other novelty, acts upon "F. W. R." and all gunmakers as a red rag does upon a flock of turkeys, it drives them demented. That is to say, provided they cannot secure to themselves exclusive patent privileges that might enable them to make some little extra charge to their customers. I am quite ready to prove the power and safety of white powder at any time or place, by appointment, and take this opportunity to remind your anonymous correspondent "F. W. R." and others, that I am not the inventor, and have no pecuniary interest whatever in the manufacture of the powder which accidentally bears my name.—I am, Sir, yours, &c.,

HENRY W. REVELEY.

am, Sir, yours, &c.,

HENRY W. REVELEY.

1, Baker-street, Reading, March 8.

| We cannot understand why Sir W. Armstrong should not be an authority upon gunpowder, because he knew how Mr. Reveley proposed to make coil guns before he made his own. Of course Mr. Reveley implies that Sir W. Armstrong pirated his (Mr. R.'s) invention. But Sir William only specifically patented the method of producing the coils. If Mr. Reveley thinks himself the first inventor of coiled guns, we would refer him to a far more ancient example than he could produce. This is the gun "Mons Meg," mounted on Edinburgh Castle, which was fired with stone shot, and which is upon the coiled principle. The coils are clearly developed where a shot has broken a fragment off the piece. As we have the pleasure of "F. W. R.'s" acquaintance, it may be a guarantee to Mr. Reveley that he is not "demented," which Webster explains as being "imbecile in mind; infatuated." We wish our correspondents would always discuss science for its own sake, and in a meaner becoming scientific men, not sake, and in a manner becoming scientific men, imputing personal and interested motives unless the

are able to substantiate their position. Mr. Reveley may be very much infatuated (or "demented" if he likes the word better) with white gunpowder, but public opinion is against it. Mr. Reveley thinks it is unreasonably so, but does he not suppose, that if white gunpowder possessed all the qualifications it should for our public service, or even for private use, it would long since have been adopted in one direction or another.—ED. M. M.]

#### TO CORRESPONDENTS.

THE MECHANICS MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly payable in advance.

of £1 is. 8d, yearly, of 100. 100. Init-yearly payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. ED, M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type, Special arrangements made for large advertisements.

RECEIVED.—C. F. J.—W. S.—M. P. S.—R. M.—G. O. H. P.—F. C. K.—A. T.—M. and W.—T. B. and H. G. W. H.—J. H.—B. B.—F. C. S.—J. N.—A. T.—B. D. J. C.—L. O.—H. W. R.—J. H.—C. B.—R. I.—D. E.—B. T. H.—R. M. S.—C. M. B.—S. E.—G. H.—B. L.—G. E.—W. H. H.—S. W.—I. C. E.—E. D.—J. E. O.—L. B. J. W. B.—R. H. S.—G. T.—M. B. L.—T. W.

### Micetings for the Taeek.

Mon. — Boyal United Service Institution. — Captain
Edmund Wilson, R.N., on "Working Heavy
Guns on the Broadside; with some Observa
tions on the All-Round Fire Combined with
the Broadside System of Armament," at

tions on the All-Round Fire Combined with
the Broadside System of Armament," at
8.30 p.m.
Society of Engineers.—Mr. C. M. Barker on "Joints
for the Prevention of Leakage in Gas and
Water Mains," at 7.30 p.m.
Royal Institute of British Architects.—Mr. E.
Ingress Bell, on "The Criticism of Architecture, with Bemarks on Architectural Exhibitions," at 8 p.m.
—Royal Institution.—Rev. F. W. Farrar on "Comparative Philology," at 3 p.m.
The Institution of Civil Engineers.—Discussion on
"American Locomotives and Rolling Stock,"
at 8 p.m.

"American Locomotives and Holling Stock," at 8 p.m.
THURS.—Boyal Institution.—Dr. H. Power on "The Eye," at 3 p.m.
FRI.—Royal Institution.—Dr. Crwm Brown on "Chemical Constitution and its Relation to Physical and Physical

# Rabal, Military, and Gunnery Items.

SEVERAL of the Frazer or Woolwich 9-inch guns have been undergoing a further endurance test daily during the past week, having already completed firing 500 rounds. They now have to stand the test of 500 rounds more, making a total of 1,000 rounds with battering observes. with battering charges.

An Institution has just been established at Liverpool for the purpose of maintaining and educating the orphan children of seamen. It is specially designed to take charge of the girls, and the boys until they are of a proper age to draught off into the training ships, such as the "Indefatigable." A sum of £4,000 has already been subscribed.

A sum of £1,000 has already been subscribed.

By the death of Lord Gough, his Royal Highness the Duke of Cambridge becomes formally the senior officer of the British army. By length of service the senior is General Sir J. F. Fitzgerald, who entered the army in 1793. The others whose first commissions bear date before the present century are Field-Marshal Sir William Gomm, General Sir A. Clifton, Field-Marshal Sir A. Woodford, who date from 1704; General Sir W. Wood, from 1797; and Field-Marshal Sir John Burgoyne, from 1798.

THE number of established and hired mechanics a Chatham dockyard provided for in the Estimates for 1869-70 is 3,102, being a slight decrease on that of last year, the number in the former year being 3,131. Of this number 1,707 are "established" 3,131. Of this number 1,707 are "established" artizans, entitled to a superannuation allowance, and 1,303 hired men. The amount required to be voted for wages for the mechanics at Chatham dockyard during the approaching financial year is £180,581. as against £177,802 for the past year. The Estimates show that several offices are abolished, while the only one created is that of master ropemaker, at a salary of £260 per annum. The sum of £7,050 is provided generally for clerks and writers, the accountants, and the medical establishments but the whole of the establishments are stated to be "under revision."

THE death of General Sir Arthur Clifton, G. C. B. K. C. H., is announced at the advanced age of 97. The deceased was one of the heroes of the Peninsular war, and was actively engaged on the memorable 18th of June at Waterloo.

THE winter general meeting of the National Rifle Association was held yesterday week, at Willis's Rooms, his Royal Highness the Duke of Cambridge, K.G., president of the association, in the chair. From the report, it appeared that the total value of prizes competed for at the National, County, and Colonial Rifle Associations during last year was £27,693 2s. 8d., whereas in 1867 it was £25,546 17s. 10d. This statement shows an increase of 47 in the number of prizes; of these, the association had given 45. The decrease in the value of the prizes was £411 2s. 3d., but in 1867 prizes to the amount of £796 were allotted exclusively to the [Belgian visitors, and this amount increased the total value of the prizes competed for.

THE "West Florida Commercial," published in THE "West Florida Commercial," puonsneu in Pensacola, states that the two Peruvian ironclads, now lying off Warrington Navy-yard, performed in their voyage from the Mississippi to that point in a manner quite satisfactory to their officers. The greatest trouble experienced was from a want of air, and the intense heat which was a necessary consequence. The thermometer while the vessels were in motion indicated, as a minimum, 120deg. of heat, which is, to say the least, not a very agreeable temperature; indeed, it is stated that a number of robust firemen had to succumb before the vessels arrived at Pensacola. If in a stretch of a little over 100 miles a number of firemen were "burnt out," it is difficult to see how the officers of the fleet can hope to take the ironclads to their destination in

### Miscellanea.

THE number of visitors to the Patent Office THE number of visitors to the recommendation of the week ending Museum, South Kensington, for the week ending the source the source the source that the source March 6, was 4,173. Total number since the opening of the Museum, free daily (May 12, 1858), 1,515,636.

A DISPATCH from Montreal states that the snow in the streets of that place is eight feet deep, and some streets are almost impassable. A statement had been published showing that the fall of snow during the winter had been about 118in., which exceeded by 38in. the total fall in any year for 20 vears past.

Professor H. E. Roscoe, F.R.S., lately exhibited and explained to the members of the Manchester Literary and Philosophical (Society the method of producting ozone artificially, and showed how it had been proved by Dr. Andrews and M. Soret that ozone was an allotropic condition of oxygen, and that three volumes of oxygen formed two volumes of

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending March 6, 1869, was—on Monday, Tuesday, and Saturday (free) from 10 a.m. to 10 p.m., 12,598; Meyrick and other galleries, 2,724; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 5 p.m., 2,209; Meyrick and other galleries, 205; total, 17,736. Average of corresponding week in former years, 10,148. Total from opening of Museum, 8,210,860.

BARON VISCONTI has just discovered at Ostia a colossal head of Vespasian, and one of Trajan of the natural size. Both are in good preservation, and appear to have been buried by the friends of those of the Cosars that frequently took place after their downfall. An immense portice has also been excavated, which is supposed to have formed an entrance to the old plain of Cybele, outside the walls

IT appears that a proposal has been made to M. Boutet, the proprietor of the Channel bridge, to undertake the connection of the town of St. Malo with the French coast by a causeway or viaduct constructed on his system, and that the Anglo-French Ohannel Bridge Company are about to undertake this work. The town of St. Malo stands upon an island, distant from the mainland, with which, however, it is in some measure connected by a causeway, usually covered by the sea.

The value of the contributions to geological know-ledge through the researches of Mr. H. C. Sorby, F.R.S., has been publicly recognised by the Geological Society of London awarding him the Wollaston gold medal, in presenting which the President (Professor Huxley) stated that, in awarding it, the Council desired to testify their appreciation of the value which they, in common with all other geologists, attach to Mr. Sorby's laborious investigations, continued to the control of the co tinued now for a period of more than eighteen years.

In the month of August is to take place the first award of the great prize of 100,000 francs, instituted by the Emperor Napoleon III., to be voted by the Academy of the Beaux Arts and the Institute of France to the French artist, painter, sculptor, or

architect who shall have produced, and entirely completed within the five years preceding the time of the award, a work of great excellence. The jury is to consist of thirty members—ten sculptors, ten painters, and ten architects. In case any of the members of this jury should become candidates for the prize they will retire from it, and their places will be filled up by the Academy.

It was stated at a meeting of shareholders held a few days since, says the "City Press," that an offer of £7 per foot for a piece of ground in the neighbourhood of Smithfield-market had been reneighbourhood of Smithfield-market had been re-fused. This would certainly lead to the inference that land in the city is not decreasing in value, and therefore it is not to be wondered at that those who possess it should seek to turn it to account in the best possible way. It is said that the former play-ground of the Charterhouse will shortly be built on, and other improvements which are talked of in the neighbourhood will soon materially change the aspect of affairs in that locality.

WITHIN the last few days living specimens have WITHIN the last few days living specimens have been forwarded to this country from Nicaragua of one of the most gigantic plants in the vegetable kingdom. It is closely allied to the Arums (or "Lords and Ladies") of our hedges, and until the present time has wholly escaped the notice of travelling botanists. It produces but one leaf, nearly 14ft. in length, supported on a stalk 10ft long. The stem of the flower is a foot in circumference, the spathe or flower 2ft long, purplish blue in colour, with a powerful carrion like odour. As this remarkable species of Aroideen is quite new to science, it has not yet received a name. it has not yet received a name.

it has not yet received a name.

The value of the exports of glass beads from Verice during 1868 was as follows:—To Bombay, Calcutta, Singapore, to the value of 1,860,000 francs; England, 1,470,000 francs; Zanzibar and eastern coast of Africa, 659,000 francs; North America, 570,000 francs; Germany, Denmark, and Sweden, 560,000 francs; West Coast of Africa, 520,000 francs; France, Belgium, and Holland, 467,000 francs; South America, 430,000 francs; Constantinople and the Black Sea, 425,000 francs; Egypt, Tripoli, and Morocco, 375,000 francs; Russia, 280,000 francs; Italy, 78,000 francs; Spain and Portugal, 75,000 francs; Java and Sumatra, 70,000 francs; making a total value of 7,830,000 francs (£313,200).

(£313,200).

At the ordinary general meeting of the Royal Institute of British Architects, held on Monday, the stat March, 1869, the president (W. Tite, M.P.), in the chair, the following recommendations for membership were read:—Messrs. Elijah Hoole and George Scamell, as associates. The following gentlemen were then belloted for, and declared to be duly elected:—Mr. Alfred Strong (associate), as fellow; and Mr. William F. Williams, as associate. The president announced the recommendation of the council, that subject to Her Majesty's gracious sanction, the Royal Gold Medal for 1869 be awarded to Professor C. R. Lepsius, of Berlin, at the special general meeting, to be held on Monday, the 5th April next.

MR. SYKES'S Bill for the Preservation of Sea Birds, now in the House of Commons, proposes to enact penalties not exceeding 20s. (half to the informer, half to the credit of the county rate), with costs, on any person killing, wounding, or taking any sea bird, or using any instrument for so doing, or having in his control or possession any sea bird recently killed, wounded, or taken, between the 1st of May and the 1st of August, the breeding season. of May and the 1st of August, the breeding season. But the Bill is not to extend to sea birds taken bonafide for use as food. The offender refusing to give his real name and address to any person requiring it is to be liable to a further penalty not exceeding 40s., with costs. "Sea birds" are to be deemed to include the different species of gulls, hawks, guillemots, cormorants, puffins, terns, oyster-catchers, but have been season to discover better the content of th skuas, petrels, gannets, divers, razor-bills, shear-waters and grebes, merganser, eider ducks, and

# Patents for Inbentions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—2580, 2584, 2596

BOILERS AND FURNACES—2580, 2584, 2598
BUILDING MATERIALS—2569, 2573, 2584,
2603, 2612, 2616, 2630, 2636, 2642
CHEMISTRY AND PHOTOGRAPHY—2647
CULTIVATION OF THE SOIL, including agricultural implements and machines.—2638
ELECTRICAL APPARATUS—2645, 2547, 2571, 2576
FIRROUS FARRICS, including machinery for treating fibre,

pulp, paper, &c.—2546 2570, 2579, 2582, 2590, 2593, 2613

pulp, paper, &c.—2546 2570, 2579, 2582, 2590, 2593, 2613 2623

FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2549, 2558, 2560, 2561 2575, 2605, 2619, 2626

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—2568, 2595, 2599, 2607, 2646

GENERAL MACHINERY—2581, 2632, 2637

LIGHTING, HEATING, AND VENTILATING—2559, 2585, 2598

MKHALS, including apparatus for their manufacture—2562, 2588, 2600, 2617, 2627

MINCELLANEOUS—2541, 2544, 2548, 2550, 2551, 2552, 2552, 2502, 2502, 2502, 2514, 2518, 2625, 2625, 2632, 2666, 2574, 2578, 2634, 2635, 2592, 2602, 2611, 2614, 2618, 2622, 2625, 2621, 2633, 2645, 2639, 2640, 2641, 2643

BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2565, 2591, 2567, 2604, 2606, 2609, 2610, 2620, 2921

STEAM ENGINES—2572, 2587, 2601, 2608, 2615, 2644

WARFARRE—2542, 2557, 2628, 2645

2541 H. B. BINKO, Kingslam. Laundry indigo. Dated August 14, 1868.

August 14, 1868.

This consists in producing what the patentee calls "indigo carmine," carmine blue," and blue paper, in the following manner:—He takes 24th, fine indigo dissolved in 12th, strong oil of vitriol; this solution, when settled, is heated in a vessel containing twenty gallons of water and 1th, of cow hair. This mixture, when cold, is again heated, evaporated down to the consistency of pasts; the hair being removed, a thin solution of gum arabic and glycerine is added, and the mixture is allowed to settle. Sheets of paper may be dipped in the solution, and dried previous to being used.—Patent abandoned.

2542 W SHAFF Redford and Fariance and the strength of the solution.

2542 W. SHAEN, Bedford-row. Explosive compound. Dated ugust 14, 1868.

August 14, 1868.
The patentee combines with the explosive substance called wood gunpowder, the substance known as nitro-glycerine, the compound mixture is advantageously formed by mixing from 10b 4to 60lb, weight of nitro-glycerine with 100lb, of wood gunpowder, but the amount of nitro-glycerine will be varied according to the purpose for which the explosive compound is required.—Patent completed.

compound is required.—Patent completed.

2544 G. NRISON, Leeds. Disinfecting apparates. Dated August 14, 1868.

The patentee uses a double chest or box, rectangular in shape, and mounted upon supports. Across the top of the box are ranged (resting on a suitable framework) a series of adjustable from bars, upon which rests the articles to disinfected, when such articles consist of clothing or articles of a like nature. When flocks, feathers, bedding or small articles are to be disinfected, perforated iron trays or shelves resting on the aforesaid framework, are used to hold the same. Underneath the plate which forms the bottom of the box, means may be arranged of producing dry heat expeditionally.—Patent completed.

2545 J. B. THOMPSON, Horton, Bucks. Coating from and (cc). Dated August 14, 1868. This invention is fully described at page 176.

This invention is fully described at page 17s.

2546 W. E. NEWTON, Chancery-lane. Combing stit. Dated
August 15, 1868.

The object of this is to discharge or take off from the
combs or cards of combing machinery, the fibrous material
in a perfectly progressive and uniform manner. The
combs or cards are secured to an endless chain, atrap, or
apron, and are placed in an inclined position. They are
provided at each end with bowls or antifriction wheels,
which come into contact with curved guides or rails.—
Patent abandoned.

2547 J. MACINTOSH, Regent's Park. Telegraph lines. Dated

2:47 J. MACINTOSH, Regent's Park. Telegraph lines. Dated August 15, 1868.

This consists in dividing long submarine lines into sections, united by relays in conjunction with local batteries or induction coils (or simply by induction coils), these being enclosed within air and water-tight vessels, submerged together, and in conjunction with the cable at the bottom of the sea, the object being to obtain signals through long submarine telegraph lines with greater rapidity than heretofore, or, the speed being the same, with a reduction in the weight of materials in the core of the cable. The local battery or electromotor sending forward a fresh current, by the action of the relay, may consist of any voltaic battery of suitable construction (devised to remain in constant action for a considerable period of time), which, together with the relay, are enclosed with the air and water-tight vessel, which is furnished with earth contacts and stuffing boxes, through which latter the two ends of the cable pass, and are hermetically sealed; when induction coils are alone used, the cable is enlarged at the point of connection sufficiently to envelope the coil, which is submerged with the cable to the bottom.—Patent completed.

2:43 C. D. Abr. Chancerviane.

as anomerged with the cable to the bottom.—Fatent completed.

2548 C. D. ABEL, Chancery-lane. Printing. Deted August 15, 1868.

This consists in first mixing one part by weight of aloes with eight parts by weight of nitric acid of 30deg. Baume. The mixture is allowed to react, either in a cold or in a heated condition, after which, the product is saturated with slacked lime in fine powder, in the proportion of one part by weight of lime to four parts by weight of the extract.—Patent abandoned.

2549 J. FLETCHER, Salford. Grinding. Dated August 15.

1868.
This consists in supporting the revolving trough of mortar mills, or mills for grinding sandor other substances upon antifriction rollers, mounted on radial spokes, which rotate around the central axle of the mill, and in grinding the axle in a centre bearing. Another part of the invention consists in raising and lowering the grinding rollers simultaneously, by means of a cross shaft, with worms or wheels gearing into wheels, the bosses of which form nuts for screws, connected to the horizontal axle of the grinding rollers. These worm wheels are turned round alternately in one direction or the other, by a friction or other wheel on the driving shaft.—Patent completed.

wheel on the driving shaft.—Patent completed.

2550 J. Hickisson, Southgate-road. Marking peacil. Dated
August 15, 1868.

The patentee combines with nitrate or other suitable
salt of silver, blue, bone, ivory black, or composition
black, black or Italian chalk, gamboge, and gum arabic.
The proportions of the matters may be varied, but those
he has found to answer are:—Nitrate or other salt of silver,
los. 1 drachm; blue, or black, or chalk, jos. 1 drachm;

gamboge, 1½ scruple; gum arabic, 1½ scruple, mixed with distilled water. Ammonia, isinglass, perchloride or etheral solution of gold and milk of sulphur, may also be added.—Patent abandoned.

added.—Patent abandoned.

2551 R. ROBINSON and G. D. EDMESTON, Preston.

Lather. Dated August 15, 1868.

This consists in combining differential gearing to the face-plate of the lathe, which gearing is connected with a cone or other well-known motion for varying speeds. The mechanism for varying rotating speeds consist in combining differential gearing (either bevel or spur) with expanding cones or pulleys, so that these cones may be made to approach each other or be withdrawn one from the other, or be expanded or contracted while in motion by turning the differential gearing by hand or by self-acting mechanism.—Patent completed.

2552 A. J. LEAK, Stafford. Pottery machines. Dated August 15, 1868.

This relates to a peculiar and economical mode of driving or actuating "jiggers," "lathes," and "throwing wheels," whereby the long line of expensive shafting, with the numerous pulleys, &c., are dispensed with by the employment of endless chains gearing into chain pulleys or toothed wheels fast on the spindle or shaft which transmits motion to the particular machine required.—Patent shandoned.

abandoned.

2553 H. REISSMANN, Watling-street. Fountain. Dated August 15, 1868.

A hollow flexible vessel is formed of vulcanized indiarubber. This contains the liquid to be projected; the base of the vessel is attached to a button on a rod free to slide through a frame which is made in a piece with or supported by a pedestal or pillar. A to-and-fro motion is imparted to the rod by a lever or button, and when a lever is employed it passes through the pedestal; a nozzle is fitted to the top of the flexible vessel.—Patent abandoned.

to the top of the flexible vessel.—Patent abandoned.

2554 H. Y. D. Scott, Ealing. Pottery kilns. Dated Angust 15, 1868.

This consists, first, in giving the containing walls of the oven or kiln arched forms resting on immovable abutments or foundations instead of on vertical walls held together by fron bands, as is now practised. Second, in the introduction of air passages at different points in the length of the flues, so as to command the means of completing the combustion of the unburned combustible gases derived from the fires wherever heat is required for the complete firing of the goods. Third, in the employment of fireplaces adapted to the production of combustible gases, and the use of small or refuse coal and slack for the production of the gaseous fuel.—Patent completed.

2555 C. Mohr and S. E. Smith, Birmingham, Wire guards. Dated August 15, 1868.

The patentees employ moulds of any suitable description, in or across which the wires are laid, and molten metal, to form the bar or other connection, is then run into the mould upon and around the wires, thus securing the wires within the casting.—Patent abandoned.

wires within the casting.—Patent abandoned.

2556 A. M. CLARK, Chancery-lane. Site. Dated August 15, 1868.

The patentee places in an iron or copper boiler about 28 gallons of pure water, and adds about 8th. of salt of sods or other alkaline salt which dissolves by heat and agitation. About 900th. of resin is put in, in small quantities, leaving an interval of time between each addition to allow of the resin being thoroughly dissolved before adding a fresh quantity. After the whole has been mixed, the heating is discontinued. About 44th. of chlorided, the heating is discontinued. About 44th. of chlorided of the saline water, as above prepared, with about 30 gallons of cold water. The resin, while still hot, is then mixed together with half of the saline water, as above prepared, with about 30 gallons of cold water. The mixture is then heated and stirred with a spatula, so as to render it homogeneous, and assumes a deep wine colour. This change is produced by the union of the prepared resin and the salt. The mixture is then allowed to settle and form a deposit at the bottom of the vessel, the liquid part being decanted and discharged. The size or deposit thus produced is then ready for use.—Patent completed.

2557 J. H. DEARLE and T. BROWN, Piccadilly. Tests.

2557 J. H. DEARLE and T. BROWN, Piccadilly. Tents.

Dated August 15, 1868.

At the four corners of the ground which the tent is to At the four corners of the ground which the tent is to cover, staves or poles are erected, and the two staves or poles at each end lean in together and meet at the top. The canvas cover of the tent is placed over these staves or poles; the two extremities of the ridge of the roof are thus sustained, and the cover is kept distended along the ridge of the roof by two ropes, each of which is attached to the upper ends of one pair of the staves or poles, and extends to a peg driven into the ground beyond the end of the tent. The cover is held out at the bottom by the four staves or poles stepping into eyes formed in it at the corners. The side walls of the tent, that is to say, the theoriems of the cover extending from the ground to a height of 5ft. or 6ft., where the slope of the roof commences, are held upright by stretchers passing horizontally across the ends of the tent, and at each end entering an eye at the upper corner of the side wall; these stretchers may be simply straight staves, of a length equal to the width of the tent, but they may advantageously be provided with screws or other straining apparatus for distending the canvas.—Patent completed.

2556 W. B. Espuer, Jamacia. Extracting molasse.

2558 W. B. ESPUET, Jamacia. Extracting molasses.

2556 W. B. ERFURT, Jamacia. Extracting molasses.

Dated August 15, 1868.

The sugar to be operated on is placed upon a surface of wire gauze or other open material forming the bottom of a chamber which, when the sugar has been introduced, is closed airtight by a cover. Beneath this chamber there is a space in which a vacuum is produced by any means, and then the air enclosed in the upper chamber over the sugar forces its way downwards through the sugar into the vacuum space, and in so doing carries with it the moisture from the sugar.—Patent completed.

2559 W. T. Hung Burwash Sussey. Candie-bolders

2859 W. T. HINDE, Burwash, Sussex. Candle-holders.

Dated August 15, 1868.

The patentee employs a piece of cork or other material fitting the socket of the candlestick, with plates top and bottom, through which a pin or rivet is passed to hold them together.—Patent completed.

2560 A. SMITH, Glasgow. Sugar. Dated August 17, 1868.

This relates to the manufacture of sugar in improved modes, and by means of general arrangements or combinations of apparatus performing the same. The apparatus comprises a number of rectangular vessels or pans

set on two straight walls, and with the fire gases from one or more furnaces at one end passing lengthwise under and heating them. The bottoms of the pans are formed with corrugations to increase the heating surface, A channel is formed across the ends of the corrugations in order to completely drain or empty the corrugations when required.—Patent completed.

2561 E. BEANES, Maidenhead. Brewers' finings. Dated August 17, 1868.

This consists in neutralizing solutions of isingless in caustic alkalies by means of an acid sulphite or bisulphite of the base used for making the solution.—Patent aban-

2562 B. HUNT, Lincoln's Inn. Decomposing sulphurets of

2562 B. Hunt, Lincoln's Inn. Decomposing sulphurets of from. Dated August 17, 1868.
A cylinder is provided with movable covers at each end, and placed horizontally en a furnace of suitable construction, by which it is heated to, say, shout one-half of its length. This cylinder communicates with a pump by which air may be forced in to a pressure of, say, from two to four atmospheres, or when so required it may be connected with an ordinary boiler for the introduction of steam at the same pressure. The top of the cylinder is provided with valves of the section and charge required to maintain the pressure within, and to give issue to the products of the reaction, and to the surplus air or steam.—Patent completed.

Patent completed.

2563 B. P. STOCKMAN, Westminster. Water meters. Dated August 17, 1868.

This consists of two cylinders and pistons combined, and working with a reciprocating action, namely, one piston up while the other is down. The two cylinders are placed side by side on a base plate common to both. The pistons are packed with a cupped leather to ensure their working watertight. At the top of the cylinders there is a capping plate upon which is seated the whole system of gearing comprising the valve apparatus. Each piston has a toothed rack attached to it in place of a piston rod, and the two racks pass through holes provided for the purpose in the capping plate. Between the two racks is a toothed wheel in gear with both, and reciprocating their ascent and descent; on the same common centre with the wheel, but capable of turning partly round independently of it, are a weighted lever and a valve which alternates the peasages for the supply and discharge. From each cylinder there is a pipe communicating with the valve face, and two other pipes also communicating with the valve face.—Patent abandoned.

2564 W. E. Newton, Chancery-lane. Fog alarum.

valve face.—Patent abandoned.

2564 W. E. Newton, Chancery-lane. Fog alarum.
Dated August 17, 1868.

This consists in placing within a hollow cylinder a trumpet or horn, which is to be acted upon by compressed air through means of a hollow plunger fitted to work within the cylinder and hollow plunger, great compactness is given to the apparatus or device; a screw plug is attached to the body of the trumpet or horn for the easy removal of the reed when necessary to renew os repair it.

—Patent completed.

2565 J. PALMER, New Hampshire, United States. Carriage springs. Dated August 17, 1868.

This consists in constructing right-and-left dies for punching out ears in any required form or size to be fixed on the ends of the main leaf of an elliptic spring preparatory to welding, which greatly facilitates the making of heads to the same.—Patent completed.

2566 W. EDWARDS, Redditch. Sewing machine needles. Dated August 17, 1868.

Dated August 17, 1868.

The needle is made of a triangular flattened form resembling the blade of a pen-knife; the eye is formed through the widest section—that is to say, from the back to the edge, instead of making it across in the narrowest section, as hitherto, the groove for the sewing thread being formed in the thicker edge or back of the blade.—

Patent abandoned.

2567 T. H. JOHNSON, Lincoln's Inn. Cleaning grain.
Dated August 17, 1868.

A "smut" machine is provided with two stationary vertical hollow cylinders placed concentrically, in the inner one of which revolves a set of secouring beaters attached to a vertical shaft; the shaft carries near its upper end a revolving suction fan working in a chamber situate above the two cylinders aforesaid, and communicating therewith by a central mouth or opening. This chamber is provided with a discharge spout at its circumference, for the discharge of the currents of air produced by the fan along with the impurities removed from the grain by the scouring beaters. On rotating the main vertical shaft, a central draught of air from the bottom of the stationary cylinders is forced or drawn upwards through the inner casing or cylinder, enclosing the scouring beaters, and also between the casing and the outer casing or cylinder of the machine or mill. Both these upward currents of air unite in the chamber containing the fan before referred to, entering by the central mouth or opening in the bottom of such chamber, and passing out by the lateral spout or mouth.—Patent completed.

2568 E. F. Bradburg, Oldham. Seeing machines.

mouth.—Patent completed.

2568 E. F. Brandury, Oldham. Seeing mackines.
Dated August 17, 1868.
A segmental hook is caused to make a partial forward rotation so as to pass its point through the loop of the needle thread until its hook can catch the loop when it makes its back partial rotation, one side of the loop passing on the inner, the other side lof the loop on the outer side of 'the shuttle, the loop being taken by the hook past the lower part of the shuttle, so that it will draw freely from the shuttle, when the next loop is made, the notch in the cavity of the shuttle-holder preventing the back movement of the loop by the friction of the returning hook. The partial rotary motion of the segmental hook is produced by a toothed segment and pinion.—Patent completed.

2569 W. CORBITT, Botherham. Stove decorating. Dated August 16, 1868.
This consists in the employment of plates of steel or other metal having ornamental designs etched thereon for stoves, fenders, &c.—Patent completed.

2570 C. J., W., A., and F. SIMPSON, Preston. Drying yarn. Dated August 17, 1868.

This consists in placing an extra drying cylinder either above, below, or between troughs, so that the yarn, after it leaves the first trough, may be dried, or partially dried, by passing round the drying cylinder before it enters the second trough, where it receives an additional coat of

size. From this second trough, the yarn passes round the second drying cylinder situate at the end of the machine, and on leaving this cylinder it is guided by means of guide rollers over a revolving fan—Patent completed.

2571 A. ALBINI and J. VARLICIA, Broad-street. Electromagnets. Dated August 17, 1888.

The patentees connect the negative end of one coil with the negative end of the adjoining coil, and the positive of the one coil with the positive end of the other, by which means the current from one end of the battery enters both coils simultaneously, and leaves them also simultaneously.

—Patent abandoned.

2572 H. J. BEHRENS and E. DART. Paris. Rotary engines

2572 H. J. Beherns and E. Dart, Paris. Rolary enginese Dated August 17, 1868.

Two pistons are mounted on two parallel shafts geared together so as to revolve in contrary directions and at the same speeds; these pistons, segmental in form, revolve in two annular spaces in communication with one another, and the shafts are placed at such a distance that the naves forming the centre of the spaces are indented in such manner as to allow a passage to the other piston, which, being adjusted, prevents steam or other fluid from passing between it and the nave. When the machine is arranged to work as a motive power engine with steam, it acts alternately on each piston by acting on the circumference of the other, which is then drawn by the gearing, and their motion thus rendered uniform; and, when the same principle is applied to a pump, the vacuum is made by the displacement of each piston, which, at the same time that it allows a quantity of water to enter by one opening, causes a similar quantity to pass off or escape by another.—Patent completed.

2573 J. Phillips, South Hampstead. Stores. Dated

—Patent completed.

2573 J. PHILLIPS, South Hampstead. Stores. Dated August 17, 1868.

A cylindrical valve or damper in the flue is worked by a knob screwed into a rod attached to the valve. This is moved up and down in a vertical slot in the top front of the stove. This flue communicates at bottom with a passage leading from the back of the ash-pit. The space under the firebox is closed in front by a door or casing having a regulator fitted thereto for admitting air when necessary.—Patent abandoned.

necessary.—ratem abandonous.

2574 J. Bridgs, Kingsland-road. Cutting shives or bungs.

Dated August 18, 1868.

The cutter spindle is made in such a manner as only to be allowed to revolve, and not alide sideways or up and down.—Patent completed.

2575 J. G. TONGUE, Chancery-lane. Grinding mills. Dated August 18, 18

August 18, 1863.

This invention relates to mills for grinding grain or other substances in which three millstones are employed, one running and two standing, in such manner that the two surfaces of the running millstone act as working parts, and which are in contact with the surfaces of the standing millstones, through the eyes of which the grain or other substance to be ground is conducted. The stationary millstones are mounted in supports, which rest in guides formed in the base or foundation plate of the apparatus, and so that they can be caused to approach towards the running millstone in such manner that the positions of the working surfaces may be readily adjusted.—Patent completed.

2576 D. G. ETTGERALD Batterses. Volute Interv.

Dated August 18, 1868.

This consists in the insulation of a signalling current by means of good conductors of electricity (metals and electrolytes) so arranged as to generate an electromotive force which opposes the secape of the signalling current when the latter is transmitted in a particular direction.— Patent abandoned.

2577 J.T. STARNES, Ratcliff, Middlesex. Ships' lamps.

2577 J.T. STARNER, MANCHELL, MARCHELL, MARCHEL

parts, any one or two of which can be obscured at will by a shutter.—Patent completed.

2578 P. B. and W. Hoder, Adelphi. Pigments. Dated August 18, 1868.

For one form of pigment the patentees take a yellow, brown, or red ochre oxides, or protoxides, or peroxides, or seequaoxides of iron, or any of the alluminous earths wherein iron forms a portion of the compound, whether it be a chromate oxide, protoxide, peroxide, sesquaoxide, carbonate, sulphite, or sulphate of iron, and grind them to an impalpable powder; they are then washed and "slopped" in a vessel of any size required for the quantity. In another vessel of like kind they wash and "slop" highly carbonized peat, so as to deprive it of fibre and earthy matter. When both these "slops" are complete they are mixed together in an iron vessel with a fire underneath, at the same time a motion is kept up in the "slopped" material to prevent the heavier material separating from the lighter; and to ensure a proper commingling of the two materials, the fire and motion are kept up until the aqueous matter is nearly evaporated, when the "slopped" materials get to a consistency that separation is impossible. The materials so compounded are dried on a kiln, or any other suitable place. It is then placed into a close retort, either of clay or iron, and kept perfectly free from air, as the admission of oxygen would prevent the iron compound in the material from taking up the carbon. A fire is placed under the retort for the space of an hour or more, at a red heat, when the whole material is converted into a black pigment.—Patent completed.

2579 D.Fraser, Forfar. Spinning flax. Dated August 18, 1852

2579 D. FRASER, Forfar, Spinning flax, Dated August 18.

1868.
This consists, first, in softening the hard ends of flax by means of suitable apparatus, whereby the flax is made to yield more in the hackling, and to join better when being spun into yarns. It consists, second, in treating the tow in combined cramping and teasing apparatus, by which it is softened, mixed, damped, and teased. Steam is applied to the flax or rovings when spinning them.—Patent completed.

2580 J. LANDLESS, Manchester. Boilers. Dated August 18, 1868.

This comists in the construction of a damper or screen composed of wire perforated plates, made of earthenware or fireproof material, placed in flues, by which a more thorough combustion of the gases is effected.—Patent completed.

2581 E. LEDGER, Peckham. Motice pour August 18, 1868.

Angust 18, 1868.

A pump is connected with the cylinder of a hydraulic ram by a tube, so that on each depression and elevation of



the piston of the cylindrical pump there will be a corresponding elevation and depression of the ram in the hydraulic machine.—Patent abandoned.

2582 L. GAY, Rheims, France. Washing wool. Dated August 18, 1868.

August 18, 1868.

A conical vessel is employed to which a slow rotatory motion is imparted; this vessel is placed horizontally, or nearly so, its extremities are only partially closed; internally it is provided with a series of projecting hooks or points. The wool, or other fibrous material to be washed, is fed in at one of the extremities, and by the rotation of the appearius gradually conducted to the other extremity, from whence it is discharged; whilst the liquid used for washing is introduced at the extremity from which the wool is discharged, and drawn off at the extremity where the wool is discharged, and drawn off at the extremity where

the wool is introduced.—Patent completed.

2583 W. THOMSON, Glasgow. Cutting tool. Dated August 18, 1868.

The tool or instrument is composed of a body piece, to which expanding comes are fastened, their ends being held in dovetailed slots in the face of the body, so that they may be free to move in a radial direction to and from the central part of the expander. Through the body of the expander a spindle passes, one end of which is provided with tapor grooves to receive the expanding comes, the other end of the spindle is screwed, so that by tightening the nut thereon against the body, the inner tapered surfaces are drawn against the inner side of the tube or ring to be expanded, and, when sufficiently tightened, the expander is rotated within the ring or tube, by which action it is expanded equally at all points.—Patent completed.

2584 E. DEANE, London Bridge. Cooking store. Dated August 19, 1868.

The patentee does not describe any construction of store.—Patent abandoned.

the patentee does not describe any construction of stove.—Patent abandoned.

2585 J. Newmann, Bedford-square. Gas apparatus. Dated Angust 19, 1868.

This consists in adapting a retort to domestic or kitchen stoves; besides the retort there is a gas washer and purifier, with a receptacle to receive the coal tar in combination with a gas-holder fitted in the ordinary manner in a water tank.—Patent abandoned.

2586 J. H. ATTERBURY, York. Earthenvare machinery. Dated August 19, 1868.

Upon a suitable iron foundation plate the patentee mounts two vertical metal standards opposite to each other, and furnished with planed surfaces on their inner sides in the centre portion of their length. On the top of the standards a horizontal shaft is mounted, on which an eccentric is placed that it is free to work between the standards, and is connected by means of a strap and rod with a crosshead to which it imparts a reciprocating movement, the crosshead being guided by the planed surface referred to. To the underside of the orosahead a die is fitted of the size and shape which it is desired to impress on the plastic material to be operated upon. This die may be heated.—Patent completed.

2587 J. Norberry and J. Shaw, Salford. Force pumps.

2587 J. NORBURY and J. SHAW, Salford. Force pumps. Dated August 19, 1868.
This consists in fitting the cupped leather on the plunger instead of in the barrel.—Patent abandoned.

instead of in the barrel.—Patent abandoned.

2688 F. Braby, Camberwell. Treating sulphate of iron. Dated August 19, 1868.

According to the first method, the patentee adds ammonia derived from any source to the waste product above mentioned, until complets decomposition takes place, by blowing air through a solution of ammonia, and then conducting the blast loaded with the volatile alkali through the solution to be decomposed. The results of this decomposition are oxide of iron, which falls, and must be washed and dried at a low red heat for commercial uses, and sulphate of ammonia, which must be filtered, boiled down, and crystallized. Secondly, he adds carbonate of ammonia or blows carbonic acid and ammonicacl gases through the crude solution of sulphate of iron. The results of decomposition in this case are carbonate of iron and sulphate of ammonia. Thirdly, he neutralizes the crude solution of sulphate of iron by adding thereto scrap iron or finely powdered oxide of iron, and boiling or digesting the same at a low temperature. The solution is mixed with a solution and the salt of the parts lime or lead, whereby useful results are obtained, the sulphate being precipitated, and the salt of iron, as the chloride acetate or other compound, remaining in solution.—Patent completed.

2589 A. CLARK, Chancery-lane. Tanning leather. Dated

2589 A. CLARK, Chancery-lane. Tanning leather. Dated

2869 A. CLARK, Chancery-lane. Tanning leather. Dated August 19, 1868.

This consists of a combination of catechu, or cutch, with common lye in various proportions. This mixture may be used alone or with a colouring matter such as alum, and with salt, or other material that will serve to plump the leather if so desired.—Patent completed.

the leather if so desired.—Favent completed.

2590 W. H. DAYRY, Caledonian-road. Drying Linen.
Dated August 19, 1868:

The apparatus is composed of two steam chests placed
in a horizontal and parallel position, one above the other,
on a suitable framing, a space being left between the
steam chests for the passage of an endless chain or apron
passing over a drum, upon which is placed the linen
fabrics or substances to be dried.—Patent abandoned.

2591 J. Heaton, Derby. Rails. Dated August 19, 1868. This consists in combining a steel or wrought-iron rail forming the wheel-bearing surface of the compound rail with wrought-iron bars, rolled of such a form as to fit accurately against the opposite sides of the web of the steel rail, and, at the same time, form a base or flat bottom flange for resting upon the sleepers. The two wrought-iron bars are bolted or riveted firmly together so as hold or grip the web of the steel rail securely between them.—Patent abandoned.

2592 T. R. Shaw Pandleton Oli Interes Dated

Patent shandoned.

2692 T. R. SHAW, Pendleton. Oil testers. Dated August 20, 1868.

On a vertical shaft fitted in bearings is fixed a disc, on the upper surface of which rests a circular or partiy circular block, the two surfaces in contact being preferably finished as true plans. The lower disc is caused to revolve rapidly by suitable means, the continued rotation of the block being prevented by a cord, one end of which is attached to the side of the block, the other end being attached to the side of the block, the other end being attached to a spring balance or to a weighted and gradual lever. The block is kept in position on the revolving disc by means of anti-friction bowls, which are so applied as not to interfere with the rotation of the block. A they momitted is fixed in the centre of the block. A smell portion

of the lubricant to be tested is applied to the disc, the metal block is placed in position, and the lower disc is caused to revolve until a certain temperature, which has been fixed upon as suitable for all seasons as, for example, 70deg. Fah. is indicated by the thermometer when the test of the oil is commenced, by noting the frictional resistance indicated on the scale of the spring balance, readings being taken from the scale at intervals during the continuance of the experiment.—Patent completed.

continuance of the experiment.—Patent completed.

2593 W. J. Almond, Cheapside. Preparing silk. Dated.
August 20, 1868.

The thread from the swifts or bobbins are wound into balls with a hollow centre, in such a way that the inside end of the thread may be drawn out with perfect order and freedom until the whole of the thread in the ball is used. This ball is placed in a box of cardboard, paper, or other suitable material, wherein it is secured in such a manner as to remain without any fastening. In the front, or one side of the box, is fitted an eyelet or perforation through which the thread may run freely without being injured by friction.—Patent completed.

2594 J. Sawyer New North-road Subse. Dated

2594 J. Sawyer, New North-road, Sashes.
August 20, 1868.
Window seebes are constructed with related

August 20, 1868.
Window sashes are constructed with rebated joints at the part where the two sashes meet together when shut for the purposes of better excluding the air, rain, and wind. The window sashes have metal plates with teeth or cogs on one side thereof (or formed with indentures or slots) forming racks. These racks are of the same length as the height of the sashes, and are let into grooves or rebated in the sides or edges thereof flush therewith; or they may form projections thereout for the purpose of hanging or suspending the window sashes.—Patent completed.

2535 G. CALKIN, Regent's Park, Taching music. Dated

suspending the window asshes.—Patent completed.

2595 G. Calkin, Regent's Park. Teaching music. Dated August 20, 1868.

The object is to designate by a ready means to the student the character and position of each note on the key-board. A diagram of the key-board, or any part thereof, is constructed in the form of a long flat rail or ledge, which is placed in front of the keys is such a position below them as not to interfere with the playing, and so that each key on the diagram shall be exactly opposite the corresponding key of the instrument.—Patent abandoned.

doned.

2596 H. N. WATERS, Connecticut, U.S.A. Steam generators. Dated August 20, 1868.

This consists in heating the water which is intended to be pumped into the steam generator up to the boiling temperature, or nearly so, with the exhaust steam from the engine, and, at the same time, separating the sediment and floating impurities which it may contain. This is accomplished by means of a cylinder, into which the exhaust steam passes by a tube; a shield is fitted on the top of the cylinder for the steam to impinge against. Cold water is admitted by a pipe leading into the cylinder.—Patent completed. -Patent completed.

2597 P. ROBERTSON, Mincing lane. Brake. Dated August 20, 1868.

The patentee connects to any brake, by a flexible tube, a vessel containing dried sand, so that the sand may be ad-mitted through an aperture in the brake to act upon the wheel.—Patent abandoned.

wheel.—Patent abandoned.

2598 A. ROLLASON, Commercial-road. Purifying gas.
Dated August 20, 1868.

The patentee takes peat, bog, or other similar decomposed vegetable matter, and, having disintegrated it, mixes with it sulphuric acid of the specific gravity of 1840 or 1848, in about the proportion of one part of the latter to two or three parts of the former; if the decomposed vegetable matter requires to be artificially dried before the sold is added, care must be taken not to burn or char it. The product is designed to be used in an ordinary gas purifying box apart from the other purifying boxes, and the gas should pass through it first after it leaves the scrubber, so that any ammonia which the scrubber has failed to work out of the gas is arrested as it passes through it forming sulphate of ammonia.—Patent completed.

2599 H. Hughes, Homerton. Seving machines. Dated

work out of the gas is arrested as it passes unuequent forming sulphate of ammonia.—Patent completed.

2599 H. Hughes, Homerton. Sewing machines. Dated August 20, 1868.

The patentee employs a series of horizontal or inclined plates or pin projections carried by an endless chain, to which an intermittent motion is imparted by a paul from the ordinary feed motion. This endless chain is secured to the work plate, and in its intermittent motion the series of plates necessarily take against the thread, when the needle is at the upper part of its motion, and thereby effect the intermittent feed of the fabric; these plates at the same time receive the whole strain of the stitch, because, after each intermittent movement, the needle, in its down stroke, lays the thread over that plate which has just acted upon the thread. In some cases came are employed on the chain to act on a lever carrying an additional or separate thread, cord, tape, or piping, in such manner that the lever lays this separate thread, oord, tape, or piping on the two sides of the needle thread alternately, whereby a variety in the work is produced.—Patent completed.

2600 H. C. Eusell, St. Helen's. Smelting. Dated

a variety in the work is produced.—Patent completed.

2600 H. C. EUSBLI., St. Helen's. Smelting. Dated August 20, 1868.

Gaseous fuel is passed through tubes or conduits, which can be heated so as to heat the gaseous fuel. By means of other tubes or conduits, nitrous gas, or exygen, or atmospheric air, either combined or separately, and either hot or cold, can be mixed with the gaseous fuel. The air and gases are introduced into the furnace, either at atmospheric air, either contained into the furnace, either at atmospheric pressure or at a pressure higher than that of the atmosphere, by means of fans or other blowing apparatus. The pipes or conduits are provided with dampers or valves, by means of which the quantity of gases or vapours and the temperature of the same may be regulated at pleasure. By the combustion of the gaseous mixture described an intense heat is produced, the combustion being effected in the reverberatory furnace in which the copper ore to be smelted is contained. The vapours and gases from the smelting furnace descend into a covered space containing a layer or layers of peroxide of iron in the state of bog iron or bog ochre, or in any other convenient form, together with haryta or other absorbent substance, according to the nature of the gases and vapours given off by the furnace.—Patent completed.

2601 N. W. NEWTON, Chancery-lane. Rotary engines. This invention mainly has reference to that class of rotary engines which employ a revolving piston, made up of or carrying radial slides, and that, together with the main or diving shaft to which it is secured, occupy, an eccentric position relatively to the cylinder in which the

piston works, and consists in the employment of steam or other impelling fluid by, in, or through an arrangement of cylinders, the one within the other; firstly, using such gas, vapour, or fluid at a high pressure on a short piston leverage, and subsequently working the same under expansion and at a reduced pressure on a long piston leverage. The invention also consists in a combination of parts and disposition of ports for thus using the steam, whereby the piston itself or radial slides thereof serve without it may be, the aid of valves, to control, not only the exhaust or final escape of the impelling fluid, but also its passage, after being utilized in a high pressure form to work expansively in a separate cylinder, upon or in connection with one and the same piston.—Patent completed.

with one and the same piston.—Patent completed.

2602 T. HAIGHT, Liverpool. Cooling liquids. Dated August 21, 1863.

The patentee takes any number of pipes, covered externally with a coating of tin, and "sweated" together in line parallel to each other; each end of these tubes are fitted into a metal casting, which is of a square or other analagous form; these castings form hollow boxes or chambers into which the ends of the pipes open, the same being divided by transverse disphragms, so arranged that the water or other cooling liquid, being at the lower end of the first chamber, will pass through the lower pipe or tube, and thence into the chamber in the casting at the opposite end of the tube, into which the lower and next tube immediately above opens, so that the water may return through the second pipe, in an opposite direction, into a chamber in the first-named casting; and so on through the series of pipes.—Patent completed.

2603 J. ELLIOTT, Southampton. Cutting stons. Dated

2603 J. Elliott, Southampton. Cutting stone. Dated

2003 J. ELLIOTT, SOULDAMPRON. Cutting time. Dated August 21, 1868.
This consists in a tool composed of a holder and a diamond or steel cutter, being caused to revolve rapidly on its own axis, and to traverse in any direction required over the surface of stone, or other hard substance to be out.—Patent abandoned.

2604 E. J. E. Niepce, Paris. Horse' blinkers. Dated August 21, 1868.

These blinkers are provided with mechanism, in connection with a bellows, expanding cap, or obturator, which it keeps constantly closed within the blinker, unless the driver. by pulling a rein attached to the mechanism, causes the obturator to open, when it completely covers the horse's eyeball, totally depriving it of sight, and causing the horse to stop; upon abandoning the rein the obturator closes again, and the horse recovers sight.—Patent completed. nleted.

2605 J. H. JOHNSON, Lincoln's Inn. Flour mills. Dated

2605 J. H. JOHNSON, Lincoln's Inn. Flour mills. Dated August 21, 1868.

A pipe leads from the closed casing of the millstones downwards to an exhausting fan. The flour and meel are timmediately blown up a vertical pipe into a hopper, the top of which is covered by a frame of gauze. The air escapes through the gauze, whilst the flour and meal is deposited in the hopper, and descends thence by the discharge spout into the "bolt."—Patent abandoned.

charge spout into the "bota — rate and another."

2606 P. N. HASLUCK, Tottenham Court-road. Discerning indicator. Dated August 21, 1868.

A stud is placed in the stock of the carriage wheel, each revolution of the wheel communicates a blow to a survivel of four pinions. Each revolution of the star wheel drives a wheel of eighty-eight teeth, and thus indicates on a dial the 1,760 yards (or one mile).—Patent abandoned.

a dial the 1,760 yards (or one mile).—Patent abandoned.

2607 F. J. KNEWSTUB, St. James's-street. Despatch
boxes, &c. Dated August 21, 1868.

This consists, first, in fitting despatch boxes at their
upper part with one or more sliding trays, which can be
made to slide entirely or partly out at the end or ends of
the box when the lid is raised. Second, in providing in a
space underneath the sliding tray or trays, leaves
arranged alphabetically or numerically, for the purpose of
allowing instant reference to papers or other articles
placed in such leaves; these leaves may either be fixtures
in an inside frame or tied in through eyelet holes, so as to
be moved at pleasure.—Patent completed.

be moved at pleasure.—Patent completed.

2608 T. W. RAMMELL, Westminster. Rotary engines
Dated August 21, 1868.

This consists in gradually reducing the size of the
radiating ducts or passages from the mouths outwards.
This reduction is made in such manner that while at their
junction with the central apertures, that is to say, at their
mouths, the ducts are collectively equal in transverse area
to the sum of the areas of the two apertures, they become
gradually smaller and smaller in proportion as they extend
outwards, and are smallest where they terminate in their
discharge outlets at the rim or periphery of the machine.

—Patent completed.

—Patent completed.

2609 J. L. CLARK, Sydenham. Train communication.
Dated August 21, 1868.

A tube is employed, extending from end to end of the train, and contains air, which is either exhausted or compressed by means of a pump worked from the axles of the tender or engine. A bell or other sounding apparatus is fixed upon the engine or tender, and in each of the guard's vans, and is so arranged as to sound incessantly as long as the train is in motion, the power for working the apparatus being taken from the wheels or springs, or other moving parts of the train. The apparatus is, however, further arranged in such manner that whenever the vacuum or pressure is maintained by the pump or bellows, the bell or sounding apparatus is silenced, either by its being thrown out of geur, or by the hammer being removed and held out of its reach.—Patent completed.

2810 B. WALKER and T. F. A. PELAUM, Loeds. Rolling

removed and held out of its reach.—Patent completed.

2610 B. WALKER and T. F. A. PFLAUM, Leeds. Rolling tyres. Dated August 21, 1868.

Two main spindles are employed, to which a pair of rollers are fixed; these run in bearings in strong framings mounted on centres, through which the driving shafts run; these shafts may be driven in any suitable manner. The centres are carried by slides capable of sliding to and from one another, from the bed of the machine, so that by bringing the slides close up to one another, the spindles may both be brought into a vertical position; or by separating the slides, they may each be made to incline one towards the other. The upper ends of the frames carrying the rolls may be drawn together by mechanism, so as to give the requisite pressure. The main spindles can be made to work at different angles and to move to or fro at either end, simultaneously or separately, as may be required. If it be required to work the machine for rolling disc wheels, the spindles are made to incline to one smother.—Patent completed.



2411 D. Evers, Hackney. Casts. Dated August 21, 1462.
This consists in making metallic vessels or casks of a square or other shape, by fixing the blank on a mandril of square form.—Patent completed.

2613 J. Tall, Southwark. Building walls. Dat news 31, 1888.

Arrust 1, 1868.

The object is to dispense with angle or ceraer pieces, and also with the upright parting pieces to which the long panels of the apparatus are attached, and also to simplify the fastenings whereby the several parts of the apparatus are connected together; and, further, to construct the panels in such a manner that they may be lengthened or shortened, as may be required to suit circumstances. This is accomplished by fixing the panels by means of bolts passing through tubes; the corners are composed of plates fastened to the panels in a similar manner.—Patent completed. complete

2813 J. WRISLEY and J. HOLDING, Lancaster. Looms. Dated August 22, 1868.

The first part relating to the "healds" consists in knitting them in fine wire and yarn, the top being composed of wire and the bottom of yarn. Also, in making the bottom of top heald, stave, or both of them square or other suitable form, to one side of which the knitted portion of the heald is secured. The second part relates to temples, and consists, first, in using but one roller of larger diameter than usual, the periphery of which is provided with metal pins for holding the cloth. The roller forms a loose box, which, as the cloth passes over it, freely revolves upon a fixed pin, retained in the box or under portion of the temple; the cap of the temple, being formed adjustable, is so arranged that it can be I owered so as to cause the cloth to press well upon and nearly embrace the upper half of the loose box, or it may be raised and secured so as only lightly to press thereupon.—Patent completed.

completed.

2614 A. B. CHILDS, Mark-lane. Cutting millitones. Dated August 22, 1868.

This consists chiefly in giving to the diamond tool or cutting points a peculiar compound motion, and also in the devices for producing such motion in combination with the devices for holding the diamond, and for moving the same in the required direction over the face of the stone.

—Patent abandoned.

Patent shandoned.

2615 W. J. and C. A. KESSELMEYER, Manchester Engine governors, Dated August 22, 1868.

The patentees connect a vessel or vessels containing a fluid to a movable part of the governor; there is also another vessel or vessels containing fluid communicating with that, or those first mentioned. As the balls rise or fall, the fluid passes from one vessel to another until a common level is attained, and the balls therefore become less or more loaded. The vessels which contain the fluid have curved interior surfaces, whereby the quantity of fluid is in proportion to every position of the balls.—Patent completed.

2616 T. M. B. Errtram, Ludgate-hill. Illuminated signs.
Dated August 22, 1868.
The pateness proposes to form the device in platinum,
after the measur of a stendil plate, and to attach the same
to a gas burner in such a manner that when the gas is
lighted the platinum will become heated by the fiame, and
present a highly illuminated surface.—Patent completed.

2617 J. WATSON, Sunderland. Hast furnaces. Dated

Angust 22, 1868.

This consists in making the interior of the furnace of various widths, by forming a series of tapers. In order to obtain a hot blast, the patentee directs the products of a bottler farnace through a flue in which air tubes are placed, leading from a blast engine, so that the air becomes heated in its passage.—Patent completed.

2618 E. D. MORGAN, Tyn-y-coed, Rbyl, Flintshire.

Sustamning apparatus. Dated Angust 22, 1868.

This consists in constructing a glove or apparatus for facilitating awimming, by providing webs between all the fingers, and between the first flager and thumb.—Patent abandoned.

2619 G. H. Barrer. Southerman

2619 G. H. BARBER, Southampton. Preserving me.
Dated Angust 22, 1888.
The patentee constructs a flexible air-tight bag
receptacle, and in this he places the meat to be preserve.
The bag is placed in a box or case having open trays
perforated partitions therein.—Patent abandoned.

2620 H. THOMPSON, Islington. Roughing horses. Dated ugust 22, 1868.

August 22, 1868.
This consists in fitting in the hollow or inner edges of
This consists in fitting in the hollow or inner edges of
shoes a triangular socket in which acrew rods can be
shoes a triangular socket in which acrew rods, carry hooks,
placed, the outer ends of the screw rods, carry hooks,
clips, or abutments, upon which the roughing spikes are
clips, or abutments, upon which the roughing spikes are
clips, or abutments, upon which the roughing spikes are
clips, or abutments, upon which the roughing spikes are

Dated — Patent completed.

2621 W. R. LAKE, Chancery-lane. Uniting railed railed August 22, 1868.

This consists in applying springs or yielding substances to fish bers of railway rails, to compensate for the expansion and contraction of the rails, and at the same time to absorb all the vibration occasioned by the wheels of a passing train.—Patent completed.

Passing train—Patent completed.

2622 W. J. Sallett, Leeds. Gravitating wheel engine.

A hollow disc is mounted upon a drum (fitted with an Anoster ring), in which a hole is made for the reception of a sanety eccentrically with the disc, and in the line of the horizontal axis of the same. Upon the inner end of the shaft, and within the disc drum, a boss is keyed, groved diagonally, say, at eight different points on its face, for the reception of sliding bars, to the outer ends of which are connected friction pulleys, which work between the peripherty of the disc drum and the inner ring.—Patent abandoned.

2623 W. CHORLTON Mandanta.

2623 W. CHORLTON, Manchester. Heald-scarpers. Dated rune 24, 1863.
The beams supporting the unsized or untreated warps the beams supporting the unsized or untreated warps the beams at the delivery end of the machine, or at the framing, at the delivery end of the machine, or at the framing, at the delivery end of the machine, or at the stand where the unprepared warps are first placed on the "tape leg" or "slashing" machine, or in the ordinary rangement in the rote of the property of the beams are prevented from revolving too freely by means of springs or weights the came each beam or roller revolves, and delivers its yarn, and delivers the delivers of the free the delivery of the part of the place.

2624 C. George, Dulwich. Artificial horizon. Dated

2624 C. GEORGE, Dulwich. Aristical sortion. Date:
August 24, 1863.
The instrument is made of two circular metal reservoirs.
The instrument is made of two circular metal reservoirs or trays, preferably formed in one casting, the one contains of the supply of mercury, and the other, which is used for observations, being provided with a glass cap or cover. These reservoirs communicate with each other by a narrow neck on their circumference, provided with a through channel, having a stop cock for regulating the passage of the mercury from one reservoir to the other, without requiring to remove the glass cover, or risk the loss of any mercury. The mercury reservoir is further provided with a spring valve or stopper to admit air or allow of its escape.—Patent abandoned.

2625 G. TIDCOMBE, Herts. Boot scraper. Dated August 24,

1868.

The patentee forms a surface of iron, steel, or other metal, by preference cast, and of trellis or other form, producing retioulate or cellular openings or open chambers, with the upper edges of the form adopted sharper than the under surface. They are applied to rest on a floor or other surface, or over a recess, or pit, or in a box prepared for them to receive the dirt thus removed.—Patent completed.

2626 A. F. ECKHARDT, Hamburg. Masuring grain. Dated August 24, 1868.

This consists in manuring and covering seeds and roots with a covering or case insoluble in water, the manure is thus retained in contact with the peeds or roots during the growth of the plant.—Patent completed.

the growth of the plant.—Patent completed.

2637 A. GODMAN, Newcastle. Furnacci. Dated August 24, 1868.

This consists in the employment of fire-bars, which are caused to vibrate vertically at the front end on a fulcrum, situate at or near their inner ends, such vibratory motion being imparted to them by means of a series of tappets or wipers adjusted on a transverse revolving shaft. The surface of each fire-bar is notched or corrugated, and are so combined and arranged as by their simple vertical movement to impel forward the full as fast as it is sllowed to enter thereon.—Patent abandoned.

2628 W. B. LARE Charcerslane. Contrides.

enter thereon.—Patent abundoned.

2628 W. R. LAKE, Chancery-lane. Cartridges. Dated August 24, 1868.

The rear end or base is formed solidly with the tube or cylindrical part of the shell, the interior corner or angle, at the junction of the base and cylindrical portion, being allied up with the solid metal, by curving or hevilling, the surface of the tube to meet the interior of the base. At the contre of the inside of the base, and in the solid metal of the same, a cup or cavity is formed with a raised flange to receive the fulminate, this flange may be either flattened over the fulminate to form the anvil, or may be turned over the fulminate to form the anvil, or may be part of the same and over the fulminate to form the anvil, or may be surred over upon a separate disc employed for that purpose.—Patent abandoned.

Patent abandoned.

2630 W. H. TOQTH, Greenwich. Bricks, &c. Dated August 24, 1868.

The patentee employs gravel, broken stone, or other bard material, containing a proportion of iron; this is wetted with a solution of sods or other alkall, together with a small quantity of sal ammoniac. The addition of a with a small quantity of sal ammoniac. The addition of a little sulphur in powder will quicken the esting of the ingredients, as it will act on the iron, and will develop heat. When well mixed, the ingredients may be moulded and pressed.—Patent abandoned.

2631 G 3 Coulse Bardoned.

2631 G. J. Collerge, High Holborn. Need's holders. Date August 24, 1868.
A holder or protector for sewing needles is composed

August 24, 1868.

A holder or protector for sewing needles is composed of two caps of 'twey, hard wood, or other material; to the edge of each cap three elastic bands are attached, the hands pass from one cap to the other, and serves to connect them together.—Patent abandoned.

nect them together.—Patent abandoued.

2632 G. S. Dragofulo, Cardiff. Forcing states. Dated August 24, 1863.

The apparatus consists of a metal tube, closed at the top, and of any length and diameter required, at the bottom of and of any length and diameter required, when it immersed in water at the bottom of a ship's hold or elsewhere. Above the inlet of water a tube is brought from an air pump or other machine for compressing air, to a jacket or casing surrounding the receptacle by which means the water is suddenly forced or expelled up the tube to the deck, and escapes by an exit pipe, whence it is conveyed away. Another supply of water then rushes into the receptacles or reservoir, and is in turn raised up the tube, and carried of by the impetus or rush of sir.—Patent completed.

2623 H. GROUND, Norwich. Bushing bung holes. Dated

2632 H. GROUND, Norwich. Bushing bung holes. Dated August 24, 1868.

A metal bush of iron is employed, consisting of a tube of a length exceeding the thickness of the stave to which it is to be applied. This tube has a flange at one end to rest against the face of the stave; the tube is formed to secure a seat for the stave or bung. The bush is placed in the hole formed for it in the stave, and then, by driving in a conical tool, the inner or unflanged end of the bush, which then projects through the stave, is expanded or opened out, so as to prevent the bush being again drawn out of the bush.—Patent completed.

2634 I Jeavons and C. Martin. Sheffield. Ship's plat-

the hole.—Patent completed.

2634 J. Jeavons and C. Martin, Sheffield. Ship's plating. Dated August 25, 1868.

Iron of any of the ordinary English brands is employed, refined or non-refined siliceous iron is taken and combined with titanic iron, obtained from ittaniferous ores (such for instance as ilmenite) in the puddling furnace, and afterwards piled in the ordinary manner, until the necessary degree of fibrous structure is produced, the plates being rolled in the usual manner.—Patent completed.

2635 R. COUCHMAN, Noble-street, London. Dre

Dated August 25, 1868.
This consists in so forming the front part of a button, atunder similar dress fastening of oval or oblong stud, or other similar dress fastening of oval or oblong form.—Patent abandoned.

2636 R. SCHOLEFIELD, Leeds. Brick machinery. Dated

2636 R. SCHOLEFIELD, Leeds. Brice machinery. Dates August 25, 1863.
This consists, firstly, in a circular disc, in which are a This consists, firstly, in a circular disc, in which are a series of moulds or recesses of suitable form for the clay or plastic material to be moulded in. This disc is mounted horizontally upon a series of friction rollers, and is capable of rotating on a central pillar, fixed upon a suitable bed plate. To the outer edge of the disc on the top side is fixed a rim or flauge projecting upward, which, with the disc, forms a hopper to receive the supply of clay, and to the under side or to the edge of the disc is formed or attached a toothed wheel, in which a pinion gears for giving motion thereto. One or more rollers are mounted on arms affixed to the pillar above the disc, to which rollers

by preference an intermittent rotary motion is given by star wheel; or a continuous rotary motion may be given to them so as to roll upon and press the clay into the moulds as the disc rotates under them.—Patent completed.

to them so as to roll upon and press the cisy into the moulds as the disc rotates under them.—Patent completed, 2637 C.J. B. Jahns, Liverpool. Obtaining power. Detect Aurust 28, 1868.

This consists in mechanism for using the power of water or vapour moving through a flexible pipe for acting as a rotary engine. The patentee constructs a parify cylindrical box having two nozzles or short pipes placed in the interior. There are three rollers of elastic scoutchous, which, at equal distances apart, are pivotted to two parallel discs connected to each other by a central shaft or axis, having one end passing through the centre of the box, and the other end working on a centre, or having both ends passing through the sides of the box. These discs revolve in the interior of the box, so that the rollers, when passing the circular periphery, may be always at equal distances from the centre, and roll on the flexible pipe which lies between them and the circular periphery. The diameters of the rollers are such that they will be slightly pressed when rolling on the fiexible tube.—Patent abandoned.

2638 W.C. Camberdes. Crushing sett. Dated August 25,

2638 W.C. CAMBRIDGE. Crushing soil. Dated August 25,

1868.

This consists in fitting a projecting rib on the rim of the wheels of the "Cambridge Clod Crusher." The improvement in barrows consists in making some of the links wider than the others.—Patent abandoned.

wider than the others.—Patent abandoned.

2639 B. J. COMEN, Hamburg. Memorandum tablet. Dated August 25, 1868.

This consists of a slate tablet or sheet fitted in a case or box, one end of the case being open to allow passage to the slate, and one of the sides being formed internally with ratchet teeth or notohes. This side can be moved outwards, when required, on a hinge or pin, but is held in place by a lock operated by a key. The side of the slate or tablet is fitted with a spring or paul to take into the ratchet teeth.—Patent completed.

2640 I. S. Angorg Rirmingham. Account books. Dated

ratchet teeth.—Patent completed.

2640 J. S. Adcock, Birmingham. Account books. Dated
August 25, 1868.

The patentee makes the journal a record of every transaction of the husiness, the journal being of itself a cash
book, a bill book, a purchase and sales book, and a disbook and is, with the exception of a ledger, the only
book necessary for keeping accounts.—Patent abandoned.

book necessary for keeping accounts.—Patent abandoned.

2641 J. Barrans. Leeds. Flattening pin and needle heads.

Dated Aurust 25, 1868.

Upon a wiltishle frame the patentee mounts a horisontal
double cranked shaft, and be connects to such cranks vertical sliding bars, to the lower ends of which adjustable jaws
are fitted capable of holding die stampers or flatteners. On
the bottom of the frame are also mounted adjustable anvils
underneath the stampers or flatteners. The crank shaft
being set in motion by a driving pulley apon one end of it,
the relative position of the die stampers and anvils are
regulated according to the required thickness of the
article to be flattened.—Patent abandoned.

2042 J. I. LOSS. Glassow. Biedleg timber. Dated

regulated according to the required thickness of the article to be flattened.—Patent abandoned.

2042 J. L. Lose, G. aggow. Bioding strates. Dated Angust 25, 1868.

The lors or beams of timber to be reduced from the rough dimensions are laid upon a travelling bed, above the bed a box is placed carrying one or more knives, so the bed a box is placed carrying one or more knives, so a reciprocating vertical movement is also imparted to the box carrying the knife or knives, so that in the downward stroke the knife or knives cut into the timber to any required length that the machine may be set to cut. The required length that the machine may be set to cut. The substitution of the horizontally, whils the splints or satipa are cross cut by a vertical cutter actually at the end and in front of the horizontal knife. When one part of the surface operated upon is thus treated, the table is traversed forward to bring a new part of the surface under the cutters, and it is similarly treated.—Patent completed.

2613 J. GILLOTT and P. COPLRY, York. Coal cutting. Dated August 25, 1868.

The patentese employ a horizontal revolving wheel or this having a series of cutters mounts in the veriphery thereof, such cutters being made to cut outwards or from the bottom of the groove or undercut to the face of the working, whilst the body of the machine itself takes its bearing against the face in order to resist the strain of the cut. In some cases guide rails may be employed. The whole is mounted on a suitable carriage made sufficiently low to admit of the cutters getting well down to to the bottom of the face for the purpose of "holing in the bottom when required.—Patent completed.

2641 J. H. Johnson, Lincoln's Inn. Condensing. Dated August 25, 1863.

August 25, 1863.

This consists in carrying off the heat from the refrigerating water or liquid as fast as it is imparted thereto, by lowing or otherwise passing cold atmospheric air through it.—Patent completed.

2645 A. M. CLARE, Chancery-lane. Brechlosds.
Date: August 28, 1868.
This consists of a short tube, made to lift out of its ple
in the end of the barrel, for the insertion of the obar
and then lowered into position so as to close the breePatent completed.

Patent completed.

2646 R. HARVEY, Bristol. Seeing machines. Dated August 25, 1868.

A bar or lever is employed which has its fulcrum on a stud, one end of the lever being forked to embrace an eccentric, which is fastened to a shaft mounted in bearings, whereby, as the eccentric rotates, it will impart a reciprocating motion to the ends of the bar or lever, and thus cause the shattle or needle, or other part operated on to travel to and fro in its race.—Patent completed.

2617 A E ROSENE Scathing lang London.

to travel to and fro in its race.—Patent completed.

2617 A. E. Boren, Scething-lane, London. Decomposing
faity bodies. Dated August 25, 1863.

According to this invention the fatty substances are
melted and treated mechanically with sulphuric acid of
66deg. to 63deg. Beaume, more or less, after which they
are boiled with water, by which the oxide of glyceryl is
separated therefrom, in a hydrated form, as glyceryl water
or sulphate of glyceryl.—Patent abandoned.

### APPLICATIONS FOR LETTERS PATENT.

Dated March 1, 1869.
628 J. Hadley, Upper Thames-street, City. Improve-

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629 A. H. Honegger, Tipping-street, Ardwick, Man-nester. A new and improved portable copying press or

machine.
630 B. C. Crawford, Newcastle-upon-Tyne, Improve

630 B. C. Crawford, Newcastle-upon-lyne, Improvements in steam boilers or generators.
631 C. E. Brooman, Fleet-street, City, patent agent. Improvements in the construction of spring mattresses, and in bedsteads for the same, parts of the improvements in mattresses being applicable to sofas and other seats. (A communication).
632 J. G. Willans, St. Stephen's-crescent, Paddington. Improvements in the manufacture of iron and steel, and in apparatus employed therein.

Dated March 2, 1869.
633 W. Olley, Enfield. Improvements in circular saw benches, a part of which improvements is applicable to

benches, a part of which improvements is applicable to other purposes.

634 J. Farrington, Charles-street, Clarendon-square, St. Pancras. Improved apparatus for travelling with ease, speed, and safety.

635 F. N. Gisborne, West Strand, and H. Allman, Ampthill-square, London, Improvements in the construction of tubes of metal and other materials.

636 J. Hall, Staines-road, Hounslow Heath. Improvements in horse-shoes.

637 J. Townsend and P. Forbes, Glasgow. Improvements in rething or purifying oils and fats.

638 J. Wood, J. Hampson, and L. and G. Fish. Preston. Improvements in the construction and working of temples and rollers for winding the cloth and other rollers to be used in power looms for weaving.

639 J. Howe, jun. Boston, Suffolk, Massachusetts, U.S.A. A new and useful improvement in navigable vessels.

Dated March 3, 1869.

G39 J. Howe, jun., Boston, Suffolk, Massachusetts, U.S.A. A new and usefal improvement in navigable vessels.

Dated March 3, 1869.

640 W. Clark, Baker-street, Portman-square. Improvements in apparatus for clipping or shearing horses and other animals.

641 F. A. Gatty, Accrington. A certain process or processes for obtaining the colouring matter of madder and another useful product.

642 J. Cooke and G. Hibbert, Richmond. A circulating heat motive-power engine.

643 J. Sloper, Walbrook House, Walbrook, City. Improvements in machines or apparatus for perforating, punching, cutting, or stamping cardboard, metal, and other meterials.

644 H. W. Goldring, Moorgate-street, City. Improved machinery or apparatus for cleaning cotton seed.

645 R. Law, and S. Hargreaves, Burnley. Improvements in warping by warping mills.

646 F. Andoe, Swansea. Improved lowering apparatus intended to be used as a fire-escape, and for obtaining access to the exterior or other wall surfaces of buildings.

647 J. Robertson and J. Shanks, Barrhead, Renfrew shire. Improvements in blowing apparatus for smiths forges and portable hearths.

648 E. Lyons, Birmingham. Improvements in lamps for burning volatile oils or spirits.

649 W. Howes and W. Burley, Birmingham. Improvements in carriage lamps, and in the arms by which carriage lamps are attached to carriages.

650 II. A. Bonnewille, Sackville-street, Piccadilly. A new and improved apparatus for doubling stuffs, tissues, and such like articles.

652 W. E. Newton, Chancery-lane. Improvements in the construction of water-closots.

653 U. E. Rewton, Eighmon, Improvements in doors for railway carriages, and in apparatus for communicating between the passengers and guard and driver of a railway train.

Dated March 4, 1869.

train.

Dated March 4, 1869.
653 D. Sword, Edinburgh. Improvements in supplying water to cattle trucks or waggons on railways, and in apparatus employed therefor.
654 A. A. L. P. Cochrane, Westminster, Improvements

654 A. A. L. P. Cochrane, Westminster. Improvements in the construction of marine structures, 655 W. H. Tooth, sen, and W. H. Tooth, jun., Ashburnham-road, Greenwich. Improvements in the construction of furnaces, specially in the form, arrangement, and mode of actuating the grate-bars, and also in the means for making the same self-acting and self-feeding, 656 E. T. Hughes, Chancery-lane. An improved process for casting chain.
657 M. G. Cole, Belvedere House, Berley Heath, Kent. Improvements in watches and other time-pieces.
658 T. Hower-oft and A. M'Gregor, Bedford Leigh. Improvements in machinery or apparatus for reaping and mowing, and for spreading and collecting grass.
659 S. Marsden, Manchester. Improvements in machinery for making bolts and rivets.
660 T. Greenwood, Leeds. Improvements in screw gill roving frames.

660 T. Greenwood, Leeds. Improvements in screw gill roving frames.
661 J. B. Spence, Manchester. Improvements in substances used for the purification of illuminating gas, and in the recovery of a waste product arising therefrom.
662 T. Forster, Streatham, Surrey, and R. Taylor, Warwick-street, Kennington. Improvements in the manufacture of printing rollers.
663 W. Macrae, Johnstone, Renfrewshire. Improvements in the construction of velocipedes.
664 J. H. Johnson, Lincoln's Inn-fields. Improvements in dyeing and printing with anillne colours.
665 W. Betts, Wharf-road, City-road. Improvements in ornamenting and producing trade marks on capsules.
666 J. Googh, Kirby-street, Hatton-garden. Improvements in the construction of cylinders for containing and distributing colour, ink, or fluid, in the combination of the same with a composition roller or rollers, and in machinery or apparatus employed therewith.

Dated March 5, 1869.
667 C. Tighe, Poultry, City. Improvements in studs or buttons, and in the mode of securing them to gloves and

buttons, and in the mode of securing them to gloves and other articles or gamments, 668 C. D. Abel, Southampton-buildings, Chancery-lane. An improved injector. 669 F. Windhausen, Brunswick, Germany. Improvements applicable to freezing and ice-making machines. 670 W. E. Gedge, Wellington-street, Strand. An improved process and improved apparatus having for object to preserve from exidation iron ships and metallic surfaces, or those of copper or iron with which wooden ships are sheathed, also applicable for testing the qualities and the homogeneity of metals.

671 H. Knight, Ryde, Isle of Wight. Improvements in instruments or apparatus for clipping horses and other animals.

672 H. A. Bonneville, Sackville-street, Piccadilly.

new and improved apparatus for fastening the knots of

new and improved apparatus for insteming the anote of neckties and other analogous articles.

673 C. E. Brooman, Fleet-street, City, patent agent. Improvements in the manufacture of fabrics by the employment of fur or down therein.

674 W. B. Waterlow, Carpenters' Hall, London Wall, City. A new or improved stamping or dating press.

Dated March 6, 1869. 675 J. Holding, Manchester. Improvements in looms

Dated March 6, 1869.

675 J. Holding, Manchester. Improvements in looms for weaving.

676 J. Loader, Upper Clifton-street, Worship-square, Middlesex. Improvements in rotary engines and pumps.

677 R. Badger, Sawbridgeworth, Hertfordshire. Improvements in shears and scissors.

678 W. S. Meldrum, Leeds. Improvements in carding engines for flax, tow, hemp, jute, wool, and other fibrous substances.

679 J. B. Spence, Manchester. Improvements in the production of substances to be used in the purification of illuminating gas, and in the recovery of a waste product arising threader or instrument for threading needles.

680 A. Morrall, Studley, Warwickshire. An improved needle threader or instrument for threading needles.

681 T. Ross, jun., Glasgow. Improvements in sildes for magic lanterns, which improvements are also applicable for other purposes.

682 H. and J. Ellis, Salford. Improvements in cranes for raising merchandise and weights of all descriptions.

683 W. G. Simon, Oakley-square, Middlesex. An improved hank for hoisting and lowering fore and aft salls, which invention may also be applied to cranes and other hoisting apparatus, and to reducing friction.

684 R. R. Bevis, Birkenhead. Improvements in screw propellers.

propellers.
685 A. M. Clark, Chancery-lane. Improvements in envelopes, and in the means employed for securing their contents.

685 A. M. Clark, Chancery-lane. Improvements in envelopes, and in the means employed for securing their contents.

Dated March 8, 1869.

636 A. Dixon, Railway-Jace, Fenchurch-street, City. Improvements in steam lubricators or greasers.

637 J. A. M'Elroy, Glasgow. Improvements in rotory motive-power pumping and measuring apparatus.

638 J. B. Roweliffe, Manchester. Improvements in the manufacture of wire cloth for paper-making machines.

639 W. Burr, King Edward-street, City. Improvements in the manufacture of compressed leather.

630 W. A. Gilbee, South-street, Finsbury. An improved apparatus for raising water.

631 J. J. E. and W. Pitt, Cleckheaton, Yorkshire. Improvements in machinery or apparatus for drilling, turning, or cutting and shaping metals or other materials.

632 C. Mather and W. Rossetter, Salford. Improvements in warping and weaving machine.

633 C. Fairbairn, Marion Villa Sciennes, Edinburgh. Improvements in the construction of furnaces.

634 L. M. Ruiz, Rue d'Antin, Paris. Improvements in purifying and clarifying all sorts of oils, whether mineral, vegetable, or animal.

635 H. Taylor, Queen-street, Cheapside, City. Improvements in the construction of spring bottoms for bedsteads, couches, and scats.

636 P. Buchan, Silver Stream, Green Island, near Belfast, and A. Guld, Belfast. Improvements in preparing for spinning jute and other vegetable fibres.

637 J. A. Jaques and J. A. Fanshawe, Tottenham, and J. T. Oakley, Grange-road, Bermondsey. Improvements in machines for grinding and surfacing rings, plates, discs, and other analogous articles made of iron or steel.

698 H. W. Cook, Ovington-square, Middlesex. An improved mode or modes of, and apparatus for, regulating clocks.

699 J. P. Budd, Ystabyfers, near Swanses. Improvements in the manufacture of iron and steel.

clocks, P. Budd, Ystabyfera, near Swansea. Improve-ments in the manufacture of iron and steel. 700 R. F. Pittz and T. H. Lee, Newnham-street, Edge-ware-road. Improvements in the manufacture of paper-

ware-road. Improvements in the manufacture of paper-hangings.
701 R. Turnbull and J. G. Piton, Cowper's-court, Corn-hill, City. Improved means and apparatus for signalling from one part of a railway train to another, the same being adaptable to warming purposes, and to signalling in ships or vessels, buildings, and other places.
702 T. Baker, Buckingham Villas, Stratford. Improvements in umbrellas, sunshades, and parasols.
703 W. B. Thompson, Dundee. Improvements in finishing textile fabrics, and in the machinery or apparatus employed therefor.
704 A. Mitchell, Leith. Improvements in cutting or dressing stone, and in the machinery or apparatus employed therefor.
705 W. Saunders and C. Smith, Newgate-street, City. An improved detachable standard board frame for dressing bags.
706 W. Saunders and C. Smith, Newgate-street, City.

ing bags.
706 W. Saunders and C. Smith, Newgate-street, City,
An improved combined chess and cribbage board or table.

#### NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Gazette," March 9, 1869. s rom the "Londol
3282 A. H. Smith
3283 G. Zanni
3280 E. T. Van Hecke
32917J. Johnson
3296 M. A. Soul
3305 M. Benson
3318 F. A. Blanchon
3312 J. and W. Adams
3314 H. Wallwork
3315 R. Oxland
3318 W. Collins, jun.
3324 J. Bronner
3325 W. E. Bates and
Dodd
3332 J. Lodge

3363 A. L. Bricknell 3370 J. Samuel

28te," March 9, 1869.

2374 F. E. Martineau
2377 M. A. F. Mennons
2379 W. Broughton
2399 O. Broughton
2399 O. Broughton
2449 C. E. Brooman
2472 J. H. Johnson
2553 C. Crabtree and J.
Stell
2574 H. E. Newton
2735 T. Spier
2736 T. Spier
2737 J. Parkins
2751 J. Parkins
2754 W. Grimits
2751 J. Parkins
2754 W. Grimits
2756 W. S. Jackson
275 J. Dobson
275 J. Jobson
275 J. Jobson
275 J. J. Pohnson
275 J. H. Johnson
275 J. H. Johnson
275 J. H. Johnson
275 J. H. Johnson
275 J. H. Gray
275 R. P. Williams
275 J. Howe Bates and T. Dodd
3332 J. Lodge
3334 J. Pannatt and T. S.
Turnbull
3339 J. A. R. Main
3363 S. Ward, W. Hurst,
and J. Tuer
3358 R. Needham
3359 B. Hunt
3362 J. Corbett
3363 A. L. Brickpall

The full titles of the patents in the above list can be

ane mittiles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

#### LIST OF SEALED PATENTS. Sealed March 5, 1869.

2794 A. Cruls 2805 G. Bischof 2814 E. Turner 3301 P. B. Cow and J. Hill 3772 F. Walton 3875 T. Warwick and A. Boyle 2740 I. L. Pulvermacher 2757 J. C. Walker 2759 C. Holland 2762 J. Burdett 2764 A. J. Fraser 2775 J. Adams Barrett 2783 T. Bennett and H.

#### Sealed March 9, 1869.

2788 J. Maynes	2894 G. Bernhardt
2792 J. Challender and B.	2893 B. Dickinson
Kitchen	2894 B. Dickinson
2803 E. T. Hughes	2901 N. Stevenson
2806 J. Roberts	2901 N. Stevenson
2813 F. Warner	2903 W. E. Newton
2835 F. Brady	3137 W. Yates
2840 R. Martin	3174 J. Ashcroft
2847 J. Orrin and T. Geer	3234 C. D. Abel
2857 W. Betts	3609 W. R. Lake
2870 J. H. Johnson	3850 W. R. Lake
2881 W. Needham and J.	3853 B. Samuelson
Kite	76 J. Knowles

# PATENTS ON WHICH THE STAMP DUTY OF £36 HAS BEEN PAID.

727 A. V. Newton 738 M. P. W. Boulton 740 P. H. Ashberry 761 J. W. Yates 784 E. Tonks 1023 J. Sparrow and S. Poole 653 W. Clark 676 J. Broadbent 677 C. W. Siemens 683 J. Norman 688 W. Richards 702 J. G. Willans 703 G. E. Denisthorpe

PATENTS ON WHICH THE STAMP DUTY OF \$100 HAS BEEN PAID.

696 W. Tongue 612 J. Fowler, D. Greig, and B. Noddings 636 E. G. Camp

PROVISIONAL PROTECTION FOR SIX MONTES Has been granted upon Specifications bearing the fol-lowing numbers:—

578	559	546	532	518	504	480	3307
574	560	547	533	519	505	490	3505
575	562	548	534	520	506	492	3707
576	563	549	535	522	507	493	8919
577	564	550	536	523	508	494	323
578	565	551	537	524	509	495	827
580	566	552	538	525	511	496	883
582	567	553	539	526	512	497	397
584	568	554	540	527	518	498	898
586	569	555	541	528	514	500	453
589	570	556	542	529	515	501	454
590	571	557	544	530	516	502	459
1	572	558	545	531	517	503	462

#### OF SPECIFICATIONS PUBLISHED LIST For the week ending March 6, 1869.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
_	s. d.		8. d		s. d.		s, d.		s. d.		8. d.
1973	0 8	2318	1 4	2345	0 4	2863		2383	0 8	2415	0 4
2030	0 4	2319	0 6	2346	0 4	2364	0 4	2384	1 0	2416	0 4
2079	0 10	2322	0 6	2347	1 6	2365	0 4	<b>23</b> 85	0 4	2417	0 4
2087	0 8	2323	0 10	2348	0 6	2367	0 4	2388	0 4	2418	0 4
2272	0 10	2325	0 10	2349	0 6	2368	1 0	2389	0 4	2419	0 4
2273	0 6	2332	0 8	2350	0 4	2369	0 10	2391	0 4	2420	0 8
2276	0 8	2334	0 6	2351	0 4	2370	0 6	2395	0 4	2428	0 4
2282	0 8	2335	0 4	2352	0 4	2371	0 4	2397	0 4	2433	0 4
2287	0 8	2336	0 4	2354	0 4	2372	0 8	2399	1 0	2446	0 8
2292	1 10	2337	0 4	2355	1 0	2373	0 4	2403	1 0	2456	0 10
2300	1 0	$\bar{2}338$	0 10	2356	0 4	2374	0 8	2404	0 4	2458	0 10
2303	0 8	2339	0 4	2358	0 4	2376	0 4	2408	0 4	2520	0 4
2305	0 10	2340	0 6	2359	0 4	2379	0 6	2410	0 4	2562	0 8
2306	1 2	2341	1 0	2360	1 0	2380	0 4	2411	0 4	3292	1 4
2312	0 10	2342	0 8	2361	0 4	2381	2 0	2412	0 4	3338	0 10
2313	0 8	2344	1 10	2362	0 4	2382			1		

NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be sent, payable to ROBERITSON, BROOMAN, and CO., Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

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#### MECHANICS' MAGAZINE.

LONDON: FRIDAY, MARCH 19, 1869.

# HYDROGEN AS AN ILLUMINATING

N every process, chemical or mechanical, a certain amount of loss or waste of either material or power must take place. results obtained by a chemical process never coincide exactly with the theoretical formula, nor, mechanically, can the work done, ever equal the power applied. An ignorance, or, what is worse, a culpable neglect of these fundamental principles, has led scientific fanatics to spend their time, money, and ultimately their lives, in a fruitless search after the impossible. The loss accruing to ordinary gas, from the very commencement of its manufacture, to the moment that it flows from the burners, as a source of illumination, is occasioned by both chemical and mechanical unavoidable imperfections. The latter is caused by leakage, owing chiefly to defective joints, unsound pipes, and the carelessness of those who are concerned in its manipulation and distribution. The former is due to chemical action solely, and could scarcely be prevented, which is not the case with the other sources of loss. About 14 per cent. may be taken as the average loss incurred in the manufacture and burning of ordinary gas, or that which represents the actual discrepancy between the theoretical and practical results. The composition of ordinary gas consists mainly of carburetted hydrogen gases; and as hydrogen itself possesses no power whatever of illumination or brilliancy, it is not, at first sight, quite obvious what advantage results from its presence. Anyone who has dabbled in elementary chemistry is aware that hydrogen gas, when tolerably pure, burns with a pale blue flame, emitting little or no light, but endowed with a very high temperature. At the same time, by causing its high temperature to act upon other bodies, such as platinum and lime, it developes a flame of great beauty and brilliancy. To a similar cause is due the illuminating properties of ordinary gas. The action of the high temperature of the burning hydrogen upon infinitesimal particles of carbon renders them incandescent, and imparts to the gas its powers of illumination. Hydrogen, therefore, destitute of brilliancy when pure, becomes possessed of that property when in mechanical combination with carbon; in other words, when it is carburetted. If it were possible to bestow upon hydrogen illuminating properties without carburetting it, as in the ordinary manufacture, the whole process would be rendered much simpler and more economical.

It has been asserted that it would be found a great advantage to employ a much larger proportion of hydrogen in the ordinary gas than what at present prevails; in fact, to constitute it rather a hydrogen gas than that of which it is now composed. A very large proportion of hydrogen is lost in the manufacturing process, which might be easily preserved and utilized, resulting in the production of a gas of a superior quality. The same may be stated with respect to other volatile and illuminating ingredients, including the paraffin and benzine, which, for the most part, are left in the bye products. Were hydrogen more carefully sought for, and preserved in the manufacture of gas, the volume would be considerably increased, in addition to a greater purity being imparted extensions, to the product. It is notorious that the undertaken. ordinary gas, in many of the smaller towns,

is so impure, and possessed of so small an illuminating power, that many persons refuse to have it laid on to their premises. composed mainly of hydrogen would be free from most of the noxious and disagreeable properties unquestionably possessed by our present great source of public illumination, but until it can be demonstrated that a better gas can be supplied at the same rate, we shall, as usual in such matters, stick to the old plan of manufacture.

#### THE DIRECT ENGLISH, AND AUSTRALIAN SUBMARINE TELEGRAPH COMPANY.

T is but a few weeks since our readers were advised of the formation of a company for extending our communication to India; and, again, this week, we have to announce the prospectus of a second company for somewhat similar objects, but with this difference: the previous company—the British Indian—promoted a scheme, an extension of successfully accomplished enterprises; the object of the present company is to strike out a line for themselves, and, as is stated, "to lay and work submarine telegraphs between England, Gibraltar, Malta, Egypt, India, China, and Australia, which shall be in English hands from end to end." As a special recommendation, it is further stated that the cable intended for this route will be little more than half that of the ordinary deep-sea cables, and "it is at the same time safer, both for laying and picking up, and quite equal for endurance". This special quite equal for endurance. This special cable has been experimented upon by Sir W. Thomson and Mr. Varley (who are the consulting electrician and electrical engineer to the company), and the results are stated to be most satisfactory, although no mention whatever is made in the prospectus as to what sort of cable has been specially selected. The capital of the company is £2,500,000, in £5 shares, and the first issue will be £750,000. The report states that "with a view of ensuring direct and advantageous communication with the continent of Europe, it is proposed to lay at once a short line between Malta and Brindisi. The contractors will engage to ship this cable not later than the end of May," and that "the directors reserve to themselves to decide whether, after this branch line is laid, a cable from Malta to Egypt, or from Suez to Bombay, shall be next laid." Malta is certainly an important station to our country, and has been, to our knowledge, in direct and advantageous communication with the Continent and with England for many years, and how the proposed cable from Malta to Brindisi is to improve that communication, we are at a loss to see; and, further, how the laying of this cable reconciles itself with the objects of the company, of having a direct submarine line in English hands, from England to India, is a

mystery to us.
On the success of this short cable it is a question for the directors to decide whether to lay a cable from Malta to Egypt or from Suez to Bombay. In the former case, a cable would be laid between two points where and working already we have two existing cables; in the second case, a cable would be laid where one is about to be laid, the British Indian Company, we lately alluded to, having contracted for the making of a cable and its submergence in the early part of next year. In either case, the intention of the directors would appear to be a direct opposition. This is most unfortunate. Submarine lines have hitherto been laid in connection with each other, and for the general public good. Extensions, by means of submarine cables, are costly undertakings, taking them at the cheapest, and it is strange that, in face of many useful and profitable extensions, such direct opposition should be

Australia are most important, and it is equally desirable that they should be in our We cordially agree with the statehands. ment of the directors relative to the objects of the company, but it is a source of regret that they do not at once endeavour to carry out their object. Their object is to place England in direct submarine telegraph communication with Gibraltar, Malta, Egypt, India, China, and Australia; and with such an object in view, we would wish them every success. Let us take a glance of how our communication at present stands. We have communication at present stands. We have two good cables from Malta to Egypt, one already contracted for from Suez to Aden and Bombay; that is the middle of the chain. Let the new company first make and lay their cable from India to China and to Australia. This would be completed in the spring, at the same time as the British Indian line to Bombay. We should then have communication with our colonies through the agency of the several companies and the continental system, on the successful completion and satisfactory working of these lines; then the cables might be laid from England to Gibraltar and Malta, and we should possess a very great desideratum, the means of communicating direct by a system from end to end entirely in English hands.

With such splendid objects in view, meeting unquestionably with the support and approval of the other companies interested, we cannot conceive how the present company have determined upon the step of laying one cable which we cannot see the advantage of, and others in direct opposition to existing cables.

Provisional contracts have been entered into with the India-rubber, Gutta-percha, Telegraph Works Company, for the and making and laying the necessary cables, the company being satisfied that the contractors have in stock sufficient gutta-percha to insulate the whole contemplated line; and from our knowledge of the contractors, we doubt not that they will be well able to undertake and carry out the necessary contracts.

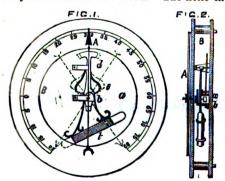
#### THE DETERMINATION OF ATMO-SPHERICAL VARIATIONS.

WING principally to the labours of the late Admiral Fitzroy, Mr. Glaisher, and other scientific and philosophical authorities, the subject of meteorology has within the last few years received an amount of thorough investigation and attention never previously bestowed upon it. In intimate connection with this vast and comprehensive science, are the instruments employed for the purpose of recording the necessary observations which serve as data for all future meteorological calculations. As may be readily imagined, these are both numerous and various, are constructed with the greatest skill and mechanical delicacy, and require to be manipulated with exceeding precision and gentleness. A visit to the Royal Observatory, and an inspection of the instruments used there for observing the occurrence of atmospheric phenomena-ordinary and extraordinary. -will amply repay any one who is ordinary—will amply repay any one who is interested in this important branch of philo-sophical study. All these instruments and apparatus may be included under two classifications. The one class are based upon physical, and the other upon chemical principles; and in some instances the two are combined in the same instrument. In all cases, the end in view is the same, namely, to record or register, and to estimate or measure, the variable conditions of the terrestrial atmosphere. To render this subject more attractive to the public, and the means of ascertaining what is commonly termed "what the weather is going to be," with greater facility, an instrument is required more ndertaken. simple in its construction, more general in Our communications to India, China, and its results, and cheaper in price than those

which are to be found in observatories and lecture rooms. The principal data needed, in order to permit any one to venture a guess at the weather, especially in so uncertain and changeable a climate as our own, are the temperature, the pressure, and the hygrometric state of the atmosphere. In other words, a combination of the thermometer, barometer, and hygrometer would compose an instrument affording the means of acting truly as a "weather glass." Comparatively speaking, it is only recently that the necessity of combining the observations recorded by these three separate instruments, in order to arrive at any accurate knowledge of the state of the atmosphere, has been recognized. They were originally regarded as having distinct offices, altogether independent of each other, and the observations recorded by the one were never imagined to bear any relation to those registered by the other. This view of the subject has fortunately yielded to the invincible power of science and experiment, and it is now well known that the observations of one are of little real value unless compared with those of the

A somewhat novel principle of constructing a true "weather glass" has been proposed by M. Bertora, of Paris. He suspends a tube, filled with mercury or other liquid, in a manner so that it changes its position or angle of inclination with the slightest variation either in the temperature or pressure of the atmosphere. So much for the abstract principle. Let us examine a little into the modus operandi. Take a glass tube, similar to an ordinary mercurial thermometer, but instead of having a bulb at one end, uniform in diameter throughout its entire length. Let it be partially filled with mercury, hermetically closed at both ends, and suspended in an inclined position between two oints, which maintain it in perfect equilibrium. At any given temperature, the small tube will rest at an angle of inclination determined by the position of its centre of gravity. If this temperature change from any cause whatever, manifestly the angle of inclination will undergo a corresponding variation, and it will be readily perceived that by the addition of a needle, a divided circle, and a delicate and simple combination of levers, these variations of the angle of inclination of the tube can be accurately registered, and consequently the atmo-spherical changes of which they are the tangible evidences.

In all instruments of this nature, the first step in their construction is to graduate them, and to fix two determinate points, marking respectively the maximum and minimum registrations, and the limits of the capabilities of the apparatus. These limits must necessarily be sufficiently wide apart These limits to admit of their including not only the ordinary but the extraordinary observations they are intended to record. The little in-



strument to which we at present allude is represented in figs. 1 and 2, and is almost self explanatory. The tube t is suspended at x. The upper portion of this support is geared into a small pinion d, the axis of which carries the sector c, which, in its turn, acts upon the central pinion b, and by means interferes seriously with their action. Never-

of its axis motion is imparted to the indicating needle A. The slightest movement of the mercury within the tube causes a change in the position of the centre of gravity, sets the sectors in motion, and, by means of the needle, registers upon the divided circle B the amount of the variation. M. Bertora considers that in accordance with this principle, thermometers, as well as barometers, might be constructed upon a large scale, so that the variations either of temperature or pressure might be rendered very appreciable, almost in a similar manner as the hours upon the face of a clock. By employing a couple of tubes, all the advantages belonging to the hygrometer might be obtained, by placing in one of them an absorbent body, and from a comparison of their relative results, deducing the hygrometric state of the air. There also appears to be no reason why pyrometers should not be constructed upon the same principle, and high temperatures accurately ascertained by its means. The determination, with any degree of accuracy, of high temperatures, has long been an unsolved problem, although there are not wanting many and various pyrometrical instruments designed solely for that purpose.

#### THE ROYAL INSTITUTION.

AST week, the Tuesday morning lecture was delivered by the Rev. F. W. Farrar, F.R.S., on "Comparative Philology." On this occasion, he spoke chiefly of the Semitic languages, of which the mother speech was probably Egyptian or Coptic. The Hebrew and the Arabic were the chief branches of the Semitic family, and all the languages of the family differ totally from the Aryan languages in structure, so that it is quite impossible that Greek, Latin, or any great European tongue, could have been derived from the Hebrew. The Hebrews do not add additional syllables to their words to change the meanings, but the consonants are always the same, and the meaning of the word is changed by altering the vowels between the consonants, so that the language is very hard and in-flexible, and quite unfitted for a scientific people. The Semitic languages are all dying out, and the Semitic races have always declined wherever they came into contact with the Aryans.

On Thursday, Dr. H. Power lectured upon the "Eye." He began with the amœboid or lowest form of sarcodic animals, revealed by the microscope, which have no eyes. worms and the rest of their family have no eyes, because eyes would be unnecessary luxuries to animals which live in darkness, and have a plentiful supply of food in contact with their mouths. Oysters have very good eyes, and plenty of them, all arranged in the fringe near the edge of the shell, so that directly any foreign substance tries to float in, the shell is abruptly closed. Snails have eyes at the tops of their horns, and when any object is placed across the path of a snail, the horns will be seen bending about to let the eyes survey the obstruction. Some of the living forms which inhabit the sea have eyes all along their sides, some have their eyes in their brain, and some again in the tips of their tails, so that they can see better behind than they can before. The dragon fly has than they can before. about 28,000 eyes.

On Friday evening, Professor Abel, F.R.S., of Woolwich Arsenal, gave a lecture before a large audience, upon "Some Applications of Electricity to Military and Naval Purposes," more especially to the firing of mines. He said that the galvanic battery is bad for such purposes, because it varies in power, is difficult to carry, and is very uncertain in action when many fuses have to be fired. Frictional electricity has been tried for the explosion of fuses, but the machines must be very carefully protected from the weather, as damp

theless, the Austrians have brought such machines to a great state of perfection, by enclosing them in cases of different kinds, but the best frictional machine to fire mines is a small one with two cylinders of india-rubber, and it will work well in damp weather. Hydro-electric machines are too much affected by the weather, and are heavy to carry. Magneto-electricity from large permanent magnets has been found to be uncertain in firing gunpowder, but the difficulty was surmounted, to a great extent, by the construction of very sensitive fuses, containing phosphide of copper, sulphide of copper, and chlorate of potash. With such fuses, magneto-electricity answered, and mines have even been fired by the small machines sold in the shops for medical purposes. Electricity of high tension will not do for submarine purposes. The dynamo-electric machines, recently introduced, have been found very good for warlike purposes, especially those machines which are strong and simple in construction, so as to be little liable to get out of order. They have the fault, that the currents from them act so powerfully by induction upon neighbouring wires, that the operator may fire one or two other mines, in addition to the one which he intended to explode. As regards torpedoes or submarine mines, electricity of low tension must be used, and galvanic electricity is best for the purpose.

Torpedoes which are fired by mechanical action, caused by contact with the bottom of a ship, are, when once laid, dangerous alike to friend and foe, and after the American war did much unexpected mischief in the harbours. A better plan is to fire them by electricity from the shore, and this is done by placing two operators at some little distance from each other, near the banks of the river or the sea beach, so that by concerted signals, they may know when a ship is passing over a torpedo, and then fire the mine. The trustworthiness and coolness of the operator is a great element in obtaining the desired results by the foregoing method. Perhaps the best way of firing torpedoes, is by means of a battery on shore, the circuit being completed by the mechanical action produced by contact with the bottom of the ship. The lecture was illustrated by numerous experiments.

On Saturday, Dr. William Odling, F.R.S., in his ninth lecture upon "Hydrogen and its Analogues," began by speaking of the "unburning" of hydrogen, and the separation of the gas from its compounds. He showed how sodium will separate the hydrogen from water with great energy, and that magnesium will do the same, but with less force; the water must be boiling, before magnesium will liberate the hydrogen from water freely. Zinc is much slower in its action than magnesium. Dr. Odling said that these methods of pulling the hydrogen away from the oxygen of water may be compared to the pulling away of a weight from the floor, by means of a greater weight connected with the smaller one, by a pulley. But as by a jerk or sudden application of direct force, a weight may be raised from the floor to the ceiling, so hydrogen may be separated from oxygen in a curious way by direct action. He illustrated this by raising a platinum ball almost to its melting point, by the heat of an oxyhydrogen flame, and then the white hot ball was suddenly placed beneath an inverted test tube full of water. This caused not only an ebullition of steam, but of a few bubbles of mixed oxygen and hydrogen gases, resulting from the de-composition of the steam by the intense heat.

#### SAFETY NITRO-GLYCERINE.

NEW method of protecting nitro-glycerine, and rendering it harmless, except under the conditions of actual work, has been invented by Mr. John Horsley, F.C.S., with whose explosive powder our readers are doubtless familiar in connection with Captain Harvey's torpedo. This new



combination was first exhibited by Mr. Horsley at a conversazione held last month in the Town Hall, Cheltenham, in connection with the Whitworth School of Science. Upon that occasion, Mr. Horsley gave a short lecture, with experiments, on explosive compounds, at the close of which he retired with several gentlemen to an adjoining lawn for the purpose of testing his newly-invented powder, for such we understand it to be. He loosely laid an ounce of it on a wrought-iron plate, a quarter of an inch thick, and exploded it by a peculiar process. The result was a terrific report, the iron plate being completely shattered. On his return, he showed the plate to the audience, who were greatly astonished at the force of the explosion, and remarks were made as to the security of our ironclads against such enormous power if developed by a torpedo. We are not in possession of the particulars of Mr. Horsley's method of treating the nitro-glycerine, which is not yet patented, but we are informed that the process is thoroughly successful. The inventor has entirely succeeded in rendering nitro-glycerine perfectly harmless and inexplosive till required for use, however severe the treatment to which it may be subjected. At any time its properties can be restored unimpaired for the use of the miner. Horsley sends us the following as proved tests of its safety:-1st. It will not ignite or explode on the application of fire or heat. 2nd. It cannot be exploded by a blow on an anvil. 3rd. It cannot be exploded by a percussion cap fired in a charge of it. As already observed, we are not in the secret of the invention, and therefore can only speak as to the proved results. These are certainly very remarkable; but we do not see anything more astonishing in them than in those attending the firing of dynamite. The new compound can only be exploded in one particular way; dynamite is in the same category. Both substances are also perfectly harmless until exploded by special and extraordinary means. We of course give Mr. Horsley every credit for his ingenuity in thus taming nitro-glycerine, but, as the case now stands before us, it is purely experimental, and we cannot discover in the new compound any superiority over dynamite.

#### NOTICES OF BOOKS.

T the close of the American war, Mr. James B. Eads, an American engineer and shipbuilder, was commissioned to examine the naval constructions of Europe, and to report thereon to the Secretary of the United States Navy. The result of Mr. Eads' investigations were embodied in a report\* to the Naval Secretary, and a copy of which has just reached us. In this document, after touching generally upon the question of naval construction, and paying a well-merited com-pliment to Mr. E. J. Reed, our Chief Con-structor, in respect of the "Bellerophon," the author goes on to criticise the turret question. He does not agree with the idea of cutting down the sides of the vessel-as in the Monitor system—to the lowest possible points compatible with flotation. The sad loss of life which has occurred from the rapid foundering of some of these vessels has taught a practical lesson of the folly of carrying this feature to too great an extent. The revolving turret is next unfavourably criticised; the author considering that it must be superseded by a system in which au equal number of guns can be protected with an equal economy of iron in a fixed casemate. The gist of the report is the publication of the author's designs for ships having from one to five fixed turrets within which the

gun-platform revolves. Here the whole battery is made to command the entire horizon, and can be brought to bear upon the same object through ports as small as the monitors, and be manipulated with equal ease and reliability. Mr. Eads of course falls foul of Captain Coles and Captain Ericsson, considering the deck joint a radical defect. He enters into the details of the proposed construction, giving a series of well-executed engravings, illustrative of the working of the system. On the whole, the "report" is not system. On the whole, the report what we expected to find it, considering its title. It is true the author submits it as result of his observations abroad," but having been commissioned "to examine the naval constructions of Europe," we should have expected something more than a little generalising about European turret ships-which could be done by the author in his own office—and a great deal of particularising about his own scheme. We do not, of course, object to inventors adopting the best means they can to publish their inventions, but we do not look for their publication in a report on the naval constructions of Europe.

The sixth annual volume of "Engineering Facts and Figures "\* is now us, and we are glad to say is no whit behind its predecessors. We need hardly state that the object of the work is to present a register of the progress in mechanical engineering and construction during each year. It is in part compiled from the MECHANICS' MAGAZINE and other scientific publications, with due acknowledgments. A leading feature in the present volume is a notice of the International Maritime Exhibition, held at Havre last year, and which was specially visited for the purposes of the work. Some additional notes are given on the Exhibition held in Paris, in 1867, which tend to complete the subjects discussed in the previous volume. The matter is, as usual, arranged and classified under distinctive headings, and thus we have boilers and boiler explosions, furnaces, fuel, and smoke prevention. The sixth division relates to steam engines; then follow in order locomotive engines, marine engines, and machinery in general. The tenth and two following divisions are devoted respectively to metals, railways, and ships. Of course there is not room for everything in such a volume, and those who expect to find it will be very properly disappointed. But the selection of matter is admirably made, and the most important points of the various subjects are given, reference being made to the work from which the information is obtained, as a guide to the reader, should he desire further details. The volume is amply illustrated, and is got up in the usual neat

Mr. Bourne's work+ on modern engines continues to be favourably received by, and to be regularly supplied to scientific readers. Parts VIII., IX., and X. are now before us, and are as full of interest as ever. In the three parts now to hand the author enters upon a description of various kinds of mill engines, marine engines, and locomotive engines, engravings and particulars of a great number of the latter being given. The plates are illustrative of steam winches, marine boilers, and marine engines, and there is an interesting appendix containing particulars of Morton's jet condenser.

We have also received Parts XI. and XII. of Mr. Burgh's treatise on the screw propeller,‡ in which we have a description of the feathering screw propeller, by Messrs. Maudslay, Sons, and Field. After this follows a description of the various arrangements for

"Engineering Facts and Figures for 1868." London and Edinburgh: A. Fullarton and Co. 1869.
† "Examples of Modern Steam, Air, and Gas Engines, of the most Recent and Approved Types." By JOHN BOURNE, C.E. London: Longmans, Paternoster-row.
† "Modern Screw-propulsion." By N. P. BURGH, engineer. London: E. and F. N. Spon, 48, Charing-cross.

feathering the blades of screw propellers, which have been proposed from time to time since the introduction of the screw. chapter is by Mr. Burgh, and extends nearly through the two parts. Chapter XVI. is devoted to a description of modern examples of thrust blocks, as fitted to screw propeller shafting, by the most eminent marine en-gineers of England and Scotland. Besides numerous wood engravings, we have folding plates, showing various screw propellers, holding down gear, hoisting apparatus, &c., as adopted in recent practice.

Mr. George Rickard has written a little

work, which will prove very interesting, as well as useful, to those who are unacquainted with the mysteries of mining, and who may desire to obtain a knowledge of the subject. The author first opens up the geological aspect of the subject, after which he views the question mineralogically, and enlightens outsiders upon the mysteries of mining terms. We then have the mechanical details of a mine explained, and are afterwards familiarised Subsequently with underground workings. to the methods of obtaining the ore, come the methods of dressing it, or preparing it for the market. This information is succeeded by some useful and practical remarks upon mining and mining companies, the whole forming a very useful little volume to the uninitiated in these matters.

The question of communication between the passengers and guards in railway trains has been solved by many minds in various ways, not so frequently to the satisfaction of others as of themselves. The American system of open trains has had many advocates, and the latest is Mr. George Lansdown, who, in a pamphlett recently forwarded to us, proposes the adoption of this method of personal communication as a remedy for the evil the recent act of Parliament seeks to meet. After considering the necessity for this means of communication, the author goes on to describe his patented method of connecting railway carriages by means of an adjustable gangway. This arrangement gangway. affords a clear passage throughout the length of a train of carriages of the present construction, although at the sacrifice of several seats in each carriage, which the alteration would involve. Of course, in new carriages, the seats might be differently arranged. It appears that a travelling post office on the London and North-Western Railway has been fitted on Mr. Lansdown's principle, and is now working in the Irish mail between London and Holyhead. There appears to be no difficulty in carrying out the scheme except that of reducing the number of seats —a difficulty we fear Mr. Lansdown will find rather insurmountable with railway directors

in the present day. The unsatisfactory condition of railway investments has induced Mr. John Imray to propose a method of improving their condi-tion. In a pamphlet! lately published, he proposes by one measure to effect two very important objects. He advocates cheap and uniform fares, which would prove a great boon to the public, whilst, in such a step, he sees as a further result not only increased but guaranteed dividends. The proposition and the arguments by which it is supported are well worthy the attention of those interested in railways, either as investors or as managers. We understand an association has been formed for the purpose of investigating the questions of railway fares, traffic, and manage ment, and we ask at their hands a quiet hearing for our author and his proposals.

<sup>\* &</sup>quot;System of Naval Defences." By JAMES B. EADS. C.E. Report to the Honorable Oldeon Welles, Secretary of the Navy. New York: D. Van Nostrand, 192, Broad-way. 1868.

<sup>\* &</sup>quot;Practical Mining, Fully and Familiarly Described."
By George Rickard. London: Effingham Wilson, Royal
Exchange. 1869.
† "Railway Travelling in the Nineteenth Century," with
plan of proposed improvements. By George LansDown, London: Pettitt and Co., 23, Frith-atreet, Soho.
1869.

<sup>1869.

1 &</sup>quot;British Railways as They Are and as They Might Be."
By John Merat, M. A., C.E. London: E. and F. N. Spon,
48, Charing Cross. 1869.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

THE STRUCTURE OF PRECIOUS STONES.

TERY few persons who admire or who deal in precious stones are acquainted with the intimate structure of these valuable minerals; and most persons will be astonished to learn that these bodies, apparently so solid and homogeneous, are often full of minute cavities, which, in general, enclose a liquid. The examination of this structure and of the included fluid must necessarily teach us much relating to the origin and formation of the minerals, and is, therefore, of great interest to us. Fortunately, the subject has been taken up by Mr. Sorby, whose remarkable researches on anhydrous fluoric acid we recently noticed; and, from his well-known skill in both physical and chemical investigations, we may naturally expect most valuable results. Mr. Sorby was fortunate in having the interesting collection of Mr. Butler placed in his hands for examination, and it is from a paper produced by these two gentlemen conjointly that we gather the following particulars. Sapphires, it would seem, in general contain fluid cavities. Sir David Brewster met with one no less than the third of an inch long, but our authors have seen none more than one-tenth of an inch in diameter. These are usually half filled with a mobile and highly expansible liquid, which, as will be seen further on, is considered to be liquid carbonic acid. Sapphires, as our readers well know, are composed of pure alumina, coloured, it is generally admitted, by a metallic oxide; but, according to Kühlmann, if we remember rightly, by some organic matter. Now, if it be clearly established that the enclosed liquid is carbonic acid, some light is thrown upon the chemical reactions and physical condi-tions by which the stone is formed. The ruby is tions by which the stone is formed. also coloured alumina. Cavities, we are told, are far less numerous in these than in sapphires, and, moreover, they appear to contain only water or a moreover, they appear to contain only water saline solution. Occasionally, a liquid with similar characters to that observed in sapphires, is seen but not often; and we are thus led to suppose that the stone may be produced by different reactions and under different physical conditions.

The cavities in spinel, another form of alumina, are partly filled with a solid or very viscous liquid, and a colourless liquid of singular properties. It seems, says our author, to contract on the application of heat, and, in passing into vapour, must expand about 600 times less than when water passes into steam. No conjecture is offered as to what this liquid may be. Emeralds are often full of cavities which contain a liquid which does not expand when heated, and is apparently a strong aqueous saline solution. The emerald is a double silicate of alumina and glucina, and the liquid may be the mother liquor from which the emerald has crystallized. Our conjecture is supported by the fact that the cavities also contain crystals, which dissolve on the application of heat, and recrystallize on cooling.

The diamond is, of course, the most interesting of all our precious stones, the origin and mode of formation of which has always been a great puzzle to chemists and mineralogists. Its structure has already been studied by Göppert, who discovered what he conceived to be organic remains, and hence infers that the diamond is the result of vegetable decomposition under peculiar conditions. Sir David Brewster first noticed fluid cavities in the diamond, and explained the optical peculiarities of some diamonds by their prosence. Messrs. Sorby and Butler, however, show, that besides fluid cavities, diamonds sometimes enclose minute crystals of a different mineral, to which circumstance these owe their peculiar optical properties. In the diamond also, the enclosed liquid appears to be carbonic acid, as shown by its extraordinary expansibility. Only one other known liquid has anything like an equal rate of expansion, and that is nitrous oxide. The occurrence of this body in minerals is, it is said, highly improbable, and it seems, on the whole, that we may be justified in including liquid car-bonic acid among natural liquid mineral substances.

A few words which relate to the formation of the stones we have mentioned, must conclude our notice of this highly valuable paper. The facts

quoted show that ruby, sapphire, spinel, and emerald were formed at a moderately high temperature, at so great a pressure, that water could be present in the liquid state. The structure of the diamond does not afford positive evidence of a high temperature, while the absence of cavities containing water or saline solution, does not prove that water was entirely absent. At the same time, the presence of what appears to be liquid carbonic acid, seems to show that only a very little water could be present either as a liquid or as steam.

#### PARLIAMENTARY NOTES.

THE most important event in the House of Commons recorded by us last week, was the moving of the Navy Estimates by Mr. Childers. We now have to notice a circumstance of equal importance—the presentation of the Army Estitimates-which took place on the evening of yesterday week. The House having gone into committee upon the question, Mr. Cardwell proceeded to move the Estimates. From the remarks of the right hon, gentleman, it appears that the real net reduction in the cost for the coming financial year, as compared with the past, amounts to £1,196,650, or equivalent to a saving of more than 10 per cent. This result had been attained by means of a review of the distribution of the troops in the colonies, and the arrangement effected by the late Government, under which a greater control had been established over the expenditure in matters of supply. The forces at home provided for by the Estimates were 90,677 men, being an increase on the previous year of 3,172 men; but to this number was to be added a regiment recalled from New Zealand, and another from the Cape of Good Hope, which would bring up the total to 92,000 men, and with a view to economy and efficiency alike, the battalions had, following the example of other countries, been reduced to 560 men each. The force in the colonies now stood at 34,850 men, a diminution of 15,170 men; the principal reductions being in Canada and the North American possessions, where the number had been brought down from 16,185 last year, to 6,245 in the pro-sent. The other reductions had been effected at the Cape and New Zealand, and a West Indian regiment had been removed from Lagos, in consequence of the cessation of the slave trade on the West Coast of Africa. All these reductions had been made upon the principle that the true defence of the colonies was not to scatter detached troops over them, but to let the world see that war with them meant war with England. The colonies were thus encouraged to rely upon their own energy, whilst the strength of the empire was consolidated and rendered all powerful for their defence in case of necessity. The nature and results of the reductions were

next described in detail by the right hon, gentleman, who mentioned, as one important feature of the contemplated changes, that with 92.000 men, comprising sixty battalions in this country, and 96,000 in India and the colonies, a considerable advance would be made towards enabling the men to pass one half of their time at least on The object which the War service at home. The object which the War Office had proposed to itself was the solution of the problem how to maintain a moderate army in time of peace, and make it effective in time of war. Bearing this in mind, he laid down these propositions: that the army ought, as regarded both men and material, in time of peace, to be comparatively small; next, that its efficiency the highest attainable; third, that it should be should be in a form capable of easy expansion; and, last, as regarded its material, that it should be of the highest quality and the greatest efficiency, and should not be accumulated in proportions so large as to be liable to become obsolete.

With regard to the militia, the right hon. gentleman stated that there was no intention to alter its local character and connection with the counties, or to withdraw from the lord lieutenants any patronage they now enjoyed in the appointment of officers to the force. But it was proposed to establish a relation between the regular army and all the voluntary forces in such a manner that the country might feel that its whole strength was welded and consolidated together. The con-

ditions upon which the officers should be chosen would be such as to ensure a greater amount of military qualifications, and £20,000 was allocated in the Estimates for improving the position of the militia officers, and with the hope that the effect would be to remove the present disinclination of gentlemen to enter the militia. The maximum of gentlemen to enter the militia. the force of militia for England and Scotland would be 90,000 men. No regiment would be allowed to exceed 960 men, and he was now engaged with the Horse Guards in making arrangements for brigading militia and yeomanry regiments with regular army. As to the volunteers, it was intended that no locality should have a greater number of corps than it required, but a larger proportion would receive the grant. Officers and non-commissioned officers would be selected solely for their efficiency, and neither social position nor any other recommendation would be allowed to compensate for a want of perfect efficiency.

With regard to the volunteers, Mr. Cardwell observed that if Parliament were asked for an additional contribution, it must not be by sowing broadcast an addition to the capitation grant, but in some mode the direct consequence of which would be to contribute to increased efficiency.

The right hon, gentleman then proceeded to sum up the whole of our military force, his statement showing that there were 90,677 regulars at home, 83,000 militia, 13,700 yeomanry, 2,000 first army reserve, 21,870 second army pensioners, and 170,581 volunteers, making a total of 381,828. Mr. Cardwell observed that we ought not to become them with a smaller force than this, which was easily capable of being augmented to 400,000 men, especially as not one of the other great Powers of Europe had a force which fell below 1,000,000 of men.

Passing on to the subject of material, the right hon, gentleman entered at some length into a detailed statement with regard to artillery and small arms. In the Fraser gun and Snider ritle we had the best weapons at present known to science, although the Martini-Henry small arm would probably supersede the latter. He also explained the nature of the arrangements made between the War Office and the India Government, and the relations subsisting between, and the joint action of the War Office and the Hotse Guards. Finally, he moved that a land force of 127,366 men be maintained for the service of the year in Great Britain and Ireland.

A discussion of considerable length followed this statement, after which the vote was agreed to.

At the same sitting, Captain Dawson-Damer asked the Secretary of State for the Home Department, whether that structure called a semaphore (an illustrated description of which appeared in our issue for December 24 last), on the crossing near the Houses of Parliament, was conducive to the safety of the public; and, if not, whether he would give instructions for its removal.

Mr. Secretary BRUCE said, that before the commencement of every session an order was issued to the Commissioner of Police to devise measures for the safety of members proceeding to and from the House, and members of the police force were stationed, at great risk to themselves, at the crossing, to ensure the safety of hon. members. During the last session one poncenna injuries received while executing his duty, and Davisment were knocked down. During the last session one policeman died from The signal crected was intended to provide against those dangers, by giving notice to passing vehicles in a more effectual manner than could be done by the outstretched arms of a policeman. The experiment had been partially successful. The signal riment had been partially successful. The signal was obeyed by the drivers of omnibuses and cabs, and was beginning to be obeyed by the less intelli-gent drivers of other vehicles. It had already contributed so much to the safety and convenience of the public, that the Commissioner of Police was satisfied of its usefulness, and recommended that the system should be extended to other parts of the metropoils.

AMERICAN LOCOMOTIVES AND ROLLING STOCK.

BY MR. ZERAH COLBURN, M. INST. C.E.

AT a meeting of the Institution of Civil Engineers, held March 9, Mr. C. H. Gregory, President, in the chair, a paper on the above subject was read. Before commencing the ordinary business, the President referred to the recent decease of one of the oldest members, Mr. James Simpson, past President of the Institution of Civil Engineers. The President observed that Mr. Simpson had left a name which would long be

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remembered with honour; by the world as a man of the most upright character, and a distinguished hydraulic engineer, by the Institution of Civil Engineers as one who for many years was a most regular and valued attendant as the meetings, and by those who enjoyed his intimacy as a faithful and devoted friend.

In the paper read it was remarked that in construction and working, the American railways represented little more than a modified application of English practice. When the systems of the railway machinery of the two countries were compared, many of the differences which first struck the eye were found to be external rather than fundamental, and so, too, many of the peculiarities of construction now retained in America were due to the initiative of English engineers.

Pursuing the history of introduction of locomotives into the States, it was observed that the first two worked in America were made in England, in 1828, one by Mr. George Stephenson, the other by Mr. J. U. Rastrick. In the same year, the engineers of the then contemplated Baltimore and Ohio Railroad visited this country. when Mr. Robert Stephenson suggested to them what was now the distinguishing feature of all American railway rolling stock, viz., the bogie, to be applied to the engines intended to work round curves of 6 chains radius, at that time proposed to be adopted. The bogie, which had grown out of William Chapman's invention of 1812, was then, Mr. Stephenson stated, in regular use upon the quays of Newcastle. Having regard to the character of the lines first constructed in the States, it was essential that the locomotives should be light and cheap, and the first engines made there, between 1830 and 1832, weighed only from 34 tons to 4 tons. Some of the Englishbuilt engines imported at about that time had their leading wheels removed, and a swivelling bogie substituted. The bogie was not, however, exclusively employed. Considerable numbers of engines made by Messrs. Stephenson and Co., Messrs. Bury, Curtis, and Kennedy, Messrs. George Forrester and Co., and Messrs. Braithwaite and Co., were afterwards imported and worked as originally constructed; and, as late as 1855, at least one hundred locomotives of English con-1855, at struction, or made almost exactly upon Messrs. Stephenson's plans, could have been counted at work in the States. For many years wood only was employed as fuel, and as it produced great quantities of sparks, as annoying to passengers as they were dangerous to goods, much ingenuity was directed to the problem of separating and withholding them from the escaping smoke and steam; and the voluminous "spark arresters" were very successful in this respect, while they gave also an individuality to the engines. Again, the rigours of the American winters compelled the adoption of some kind of shelter for the enginemen and firemen; and this was afforded by the bulky, and often extravagantly painted, "cabs," which imparted a novel appearance, but without in any way affecting the principles or economical con ditions of working of the engine.

As high speeds were seldom attempted upon the As mgn species were sentom attempted upon the early American lines, the greatest steam tractive power was sought and obtained, both by working high-pressure steam and by employing driving wheels of small diameter. Thus, although, in 1835, the English-built engines, and those copied from them were worked at 50th pressure and from them, were worked at 50lb. pressure, and had 5ft. driving wheels, it was not long before American practice settled upon 90lb. to 100lb. pressure and 4ft. or even 3ft. 8in. driving wheels. It was soon found, however, that the adhesion weight upon a single pair of wheels, necessary to work up this increased steam tractive force was too great for the strength of the way, and coupling was then resorted to; and now, with the exception of a few light tank engines on branch lines, there was not probably an engine in the States having single or uncoupled driving wheels. Four tons might be said to have been the maximum per wheel for many years, while three tons was the more usual average. Compensating levers, generally made of long steel springs, were now employed on all American engines, whereby the weight was not only equalized between the coupled wheels, but the effect of a jolt upon one was divided and distributed, through the springs and levers, upon the other pair. For some years, too, the bearings of the outer ends of the springs of the coupled wheels were made to rest upon india-rubber blocks.

The details were then given of several descriptions of engines long worked on the Baltimore and Ohio and Reading Railroads, as well as of that goods and passenger trains amounted on an average Horse Guards.

employed to work the incline of 1 in 161 and 114 mile long at the Madison terminus of the Madison and Indianapolis Railway. Compared with English practice, in which six-wheeled coupled engines had from 5 tons to 6 tons on a wheel, and eight-wheeled coupled engines had 7 tons on a wheel, it was observed that the subdivision of weight in American engines was carried about half as far again, or, in other words, that they averaged only about two-thirds as much weight per wheel, and that they thus required, for a given total weight, half as many more wheels. Except with smaller wheels, this could not be done on any practicable length of wheel base; but none of the American goods and bank engines, of which the particulars had been given, had wheels larger than 3ft. 11in. in diameter. There were objections also, of much weight, to coupling a large number of wheels from a single pair of cylinders. It was more or less difficult, if not impossible, to preserve an exact equality in the diameter of the wheels, an exact parallelism of the axles, and an exact equality in length of the coupling rods. extent to which coupling had been carried in American goods engines had been due, in a great measure, to the following expedients. coupled wheels were as equally loaded as possible; their tyres, in a majority of cases, were of chilled cast iron, since replaced by steel, and the former were cast, and the latter turned, nearly or quite to a cylindrical form, or with but little or no cone. The driving wheels were the middle pair, or in the case of an even number of pairs, one of the pairs nearest to the mid-length of the wheel base; compensating levers were employed, and adjusting wedges had for some years been applied to the axleboxes. The coupling rods, in many cases, were made without brasses, round steel bushings being fitted to circular eyes formed at the exact required distance apart in the ends of the rods.

With the exception of the leading and trailing wheels, the coupled wheels were generally fitted plain cylindrical tyres having no flanges. Outside coupling cranks, necessary with outside frames, had rarely been employed, and were never The coupling rods were counterweighted within the wheels themselves, no attempt being made, in inside cylinder engines, to set off their weight against that of the cranks and attached parts. In other words, the coupling pins of the driving wheels were coincident, on each side of the engine, with the position of the crank in inside cylinder engines, and, of course, necessarily so in outside cylinder engines. The experience of American locomotive engineers had been to the effect that with this arrangement, which was the opposite of English practice, the axle-boxes wore more uniformly, and that there was less "knocking" where a little play in the horn plates had once begun. And lastly, the length of the crank being one-half the radius of the small coupled wheels employed, any inequality in the length of the coupling rods was attended with less slipping and binding than where, with larger wheels, the crank was but one-third the radius of the wheel.

The general form of passenger engine now in uso in the States was then described. It had, in most cases, outside cylinders—indeed, inside cylinder engines had not been built for many years-and it had invariably four coupled driving wheels, and a four-wheeled bogic. The leading dimensions of the representative type of passenger engines were—cylinders from 15in. to 17in. in diameter, with a length of stroke of from 22in. to 24in., and coupled driving wheels of from 5ft. to 5ft. 8in. in diameter. Such engines would exert a tractive force of 31 tons to 4 tons in starting, for which their adhesive weight, assisted sometimes by sand, was sufficient; and thus they could get quickly away from stations even with trains of a gross weight of 200 tons or more. Economy of fuel had not been studied to the same extent in America as in English loco-motives. The blast pipes of the former were smaller, the draught more forced, the back pressure greater, and less expansion was attempted in the cylinders, the link motion being generally arranged to cut off at one-third stroke as a minimum, and at nine-tenths or more as a maximum. It was thus that boilers of moderate size were made to supply steam for work equal to 300 indicated horse power, or the exertion of upwards of two tons of draught upon a passenger train at a mean speed of twenty-five miles an hour; but there was nothing remarkable in the consumption of from 50lb. to 60lb, of coal per mile in such work. It was stated that on the Pennsylvania Central Railroad, a line 356 miles long, with gradients of 1 in 100

to about 70lb. per train mile, the goods mileage being three and a-half times the passenger mileage. The coal was of excellent steaming quality, and cost about 3½d. in currency, or 2½d. in coin, per train mile. At this rate, a difference in consumption of 24lb. of coal per mile would only cause a variation of a penny per mile in the cost of fuel and it had been argued that such a waste was better than the alternative of employing an engine four tons or five tons heavier, to work with a less rapid rate of combustion, a slower piston speed, and more expansively.

The goods engines were moderate in weight, had large cylinders and small wheels, and drew heavy trains at a fair speed with a consumption of coal often amounting to 100lb. or more per mile. On the Pennsylvania Central Railroad, the standard type of this class of engine had ten whoels, of which six, each 4ft. Gin. in diameter, were coupled. The whole weight of the engine was only 31½ tons, and of this but 23½ tons rested on the coupled wheels, available for adhesion. The cylinders were 18in. in diameter, with a length of stroke of 22in. With 60lb, mean effective pressure per square inch upon the pistons, these engines would exert a tractive force, less their own internal resistances, of rather more than 3½ tons, or about one-seventh their adhesion weight, although in starting a train, or in ascending a gradient, with 100lb. pressure on the pistons, the steam tractive force would be 6 tons, equal to more than one-fourth of the adhesion weight, the efficiency of which would then be assisted, when necessary, by sand. Details of the performances of some of these engines were next given. In one case, after allowing for gravity 8 glb. per ton, for a train, engine and tender included, of 1,040 tons weight, the total resistance would be four tons, and thus the work done on each mile was calculated to be equal to 24 horse power exerted for one hour, and if the estimates could be trusted, the conand if the estimates could be trusted, the consumption of coal per horse power per hour would not exceed from 4½b. to 5½b. The speed probably was not more than 15 miles an hour, corresponding to 360 horse power. The policy of American railway managers with respect to goods traffic, as it was also the policy of the managers of most of the French lines, was maximum loads at slow speeds, involving a minimum resistance per ton, and correspondingly minimum resistance per ton, and correspondingly a minimum working expenditure per ton.

No experiments upon the dynamical efficiency of American engines had been made, so far as the author was aware; but he had run an experi-mental train on the Erie Railway, over the whole length of the line and back, a total distance of nearly 900 miles. The same engine was employed throughout the run, occupying in all nearly weeks, making an average for each week-day of about 50 miles. The results of these experiments appeared to show that the resistance of bogie rolling stock, even under disadvantages, was less than that of English rolling stock as ascertained by the best authorities, and also that the ratio of adhesion to weight averaged considerably more in the States than in England. With respect to adhesion, as the surfaces in contact were identical with those on English railways, indeed the rails and tyres in general use in the States were commonly of English manufacture, and any difference in this respect must be attributed partly to the influences of climate and partly to a better application of sand, when necessary to increase the bite upon the rails. The sand was dropped equally upon both rails, not in intermittent handfuls down a pipe on one side of the engine only, but by means of the hand gear and re-gulating valve since adopted on the North London Railway. The experiments in question were, no doubt, influenced by the favourable circumstances of weather, and something was to be allowed also for the great length of train drawn, very long trains having a less tractive resistance per ton on a level than short ones, and something, possibly more than was commonly supposed, might have been due to the use of oil-tight axle-boxes, the saponaceous compound grease " being nowhere known as being nowhere in use on railways in the States. Messrs. Guebhard and Dieudonne's experiments, made in 1867, on the Eastern Railway of France. showed a considerable diminution in the resistance of oil-boxed rolling stock as compared with that fitted with greaseboxes.

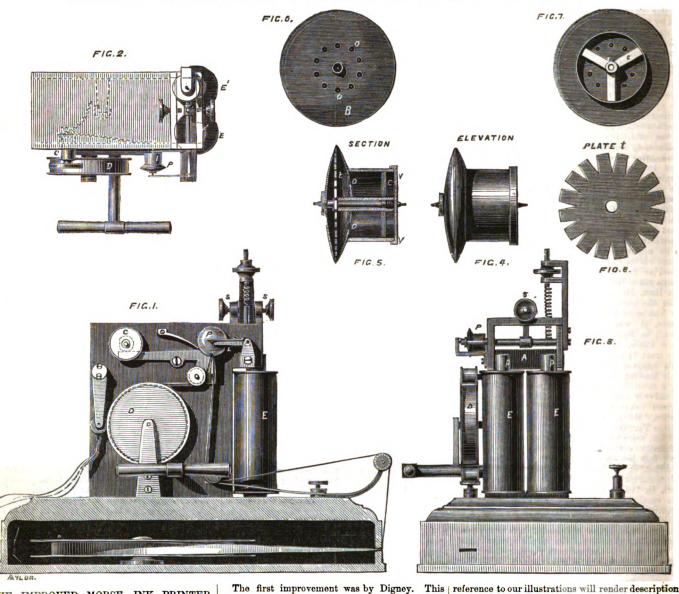
(To be concluded in our next.)

It is announced that Lord Strathnairn will succeed the late Lord Gough in the command of the Royal Horse Guards.

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#### THE IMPROVED MORSE INK PRINTER.

PATENTED BY THE INDIA-RUBBER, GUTTA-PERCHA, AND TELEGRAPH WORKS COMPANY.



#### THE IMPROVED MORSE INK PRINTER.

THERE are few telegraph instruments that have come into more general and universal use than the special type known as Morse instru-ments. For many years, the only recording form adopted was that of "embossing." In America, Morse instruments were, and are, still greatly used, but generally as "founders," the messages being received purely by sound, and no record whatever kept. In England and Europe, the form of recording or "embossing" instruments was much the same. Whilst the various parts of the instrument frequently underwent changes, the embossing arrangement remained almost identical, and consisted of an electro-magnet and an armature, sisted of an electro-magnet and an armature, having attached to it a lever of varying length, having at its free end a metal style. On the attraction of the armature, this style, pressed against a strip of paper passing over it, and so "embossed" the Morse letters. This kind of record is not sufficiently permanent, the marks being accellent freed and when the whole of printing record is not sufficiently permanent, the marks being easily effaced, and when the plan of printing with ink was introduced, it met with a great deal of attention, and improvements have been going on up to the present. The first introduction of Morse printing by ink is due to a Hungarian of the name of Mr. Thomas Sohn, this was in about 1950. The thing was in about 1950. Mr. Thomas Sohn; this was in about 1856. In this plan, the paper travels in front of a small disc, half immersed in Indian ink; the disc being in connection with the armature, is forced against the paper when any signal is made, and the marks are shown accordingly. There was great room for improve-ment in this machine, and improvements followed fast on improvements, but the system remained the same. The marks were made on the paper by the action of the armature. In some cases, the armature lifts the paper against the printing disc; in others, the disc is moved against the paper.

consisted in having a felt roller provided with ink; against this revolved a thin disc, whose outer edge was consequently well provided with ink. Beneath this disc passed the paper, supported on a lever, in connection with the armature. The signals were recorded by the pressure of the paper against the disc. This instrument has been very generally adopted, as also have those containing the improvements of Messrs. Siemens. The first of these is a slight variation upon that of Digney, substituting for the felt roller (which frequently requires replenishing) a small bottle containing a supply of the ink; the end of this bottle is stoppered with thick felt. By fixing this in place of the felt roller, with mouth downwards, a constant reservoir is formed for the disc to revolve against. It has this great disadvantage. With heat, &c., the felt is apt to dry and harden, and the supply of ink becomes too small. Clerks are apt to encourage the supply by perforating the felt with pins and needles, the result being an overabundant supply, deluging the instrument with ink. In their second improvement, Messrs. Siemens enclose the ink in a bottle or bath, in which the disc is half immersed. The other modifications are not sufficiently good to invite further attention. In all the plans we have called attention to, there is a disadvantage that is embraced by all—a fault that with the mechanism employed in telegraphy should invariably be absent—the quantity of ink and dirt that is sure to get about the instrument, and, with the exception of the last improvement, and uncertainty of supply.

The latest improvement that has been made in the Morse ink printing instrument is that patented by the India-rubber, Gutta-percha, and Telegraph Works Company (Limited). In addition to the absence of the disadvantages specified, it possesses several peculiar and valuable advantages. A

reference to our illustrations will render description more easy. Figs. 1, 2, and 3 show views of the printing instrument itself, and figs. 4 to 8 explain the construction of the "ink pen." The electromagnets E E attract the armature A (figs. 2 and 3). Attached to the armature is an arm L, having at its free extremity the pen P, under which passes the printing paper, proceeding from the roll under the instrument. The paper is drawn off by the drum D. The action of printing is the same as in other instruments. The electromagnets being excited, the armature is attracted, and the pen comes against the paper, and causes a mark or line so long as the current is continued, or causes the usual Morse signs to be recorded at the volition of the sender. It is in the construction of this pen that this improvement differs most materially from other inventions, and claims to be an improvement per se. It is not only a pen, but a reservoir—a continual wasteless pen, requiring refilling but seldom, always ready and never failing, and clean in the extreme. Fig. 4 gives an elevation of the "pen," and fig. 5 a section. The ink is contained in the reservoir R, and is filled by unscrewing the back portion b b. The ink is poured into the reservoir through the holes at C (fig. 7). In front of the reservoir is a concave plate B, forming one of the nibs of the pen, and having holes at o o (fig. 6), through which the ink passes into the pen. The other nib of this pen is formed of a piece of metal similar to B, but without perforations. Mounted on the same axis, and between the two nibs (fig. 5) is placed the slotted disc X (fig. 8), which serves to carry the ink to the nibs. It will readily be seen how clean and certain this pen is in its action—how neverfailing, so long as any ink is left—and without waste, as no ink can be used, nor can any come from the pen unless the paper touches it.

The other improvements in this instrument, which is a direct-acting printer, are, first, the addition of the large drum for drawing off the paper. This drum presents a greater surface, thus lessening the power of spring on the biting roller, in consequence of which two wheels and pinions in the train can be dispensed with. By the arrangement of the cam at O, the paper is moved to or from the "pen," as the machine is started or stopped, thus keeping it free, should the instrument be required for an intermediate station, and preventing the waste of ink which would otherwise be the case; by insulating the brackets and which is a direct-acting printer, are, first, the addiwise be the case; by insulating the brackets and wise be the case; by insulating the brackets and screws S at the top of the frame, the printing bar or armature may be used for transmitting, as in ordinary instruments. By the power and delicacy of the electro-magnets, it is possible to work this instrument on long circuits without relays.

The second improvements in this instrument and

Instrument on long circuits without relays.

The several improvements in this instrument, and the excellent manner in which it is constructed, would in themselves be sufficient to recommend it to attention, but the special feature it possesses in its "ink pen," with its numerous advantages, places this instrument in the first rank as a Morse pristing machine. We speak advisedly with record. places this instrument in the first rank as a Morse printing machine. We speak advisedly with regard to its advantages and utility, as we have witnessed its working at the United Kingdom Telegraph Company's office, where it has been working for several months past without relay on the long circuit of London and Glasgow. During that time it has earned a large amount of praise, and the extraordinary clean state of the instrument, as compared to the other ink printers, was remarkable. compared to the other ink printers, was remarkable.
An instrument of similar construction, but with the latest improvements, was exhibited at the late soirée of the Royal Society by the patentees.

### THE FOUNDER OF THE SCIENCE OF THERMODYNAMICS.

one of the meetings of the Manchester AT one of the meetings of the Manchester Literary and Philosophical Society, Professor William Jack, M.A., laid on the table Professor Tait's new work on Thermodynamics, presented to the Society (of which he is an honorary member) by the author. In so doing, he called attention to the estimation in which Professor Tait held the work of Dr. Joule in laying the foundation. held the work of Dr. Joule in laying the founda-tions of the science. It was well known that the claims of Mayer to the first place in connection claims of Mayer to the first place in with the subject were strenuously advocated by with the subject were strenuously advocated by some authors. Professor Tait considered those of some authors, appearably superior. The equiva-Dr. Joule incomparably superior. The equiva-lence of a definite quantity of work to a definite quantity of heat had been indicated as extremely probable by the experiments of Rumford; and Davy's celebrated experiment, in which he melted ice by friction, confirmed the view that work was really so convertible, modifications of Rumford's experiments would have enabled him to present the heated body in nearly the same state after as before heating, except as regarded the increment of temperature. These, however, had not been made, and the experiments appear to have been

In all heating there are three mechanical results neglected. In all heating there are three mechanical results of work possible:—I. That the particles of the body may be set into more rapid vibration.

2. That their distances may be changed by dilatation or contraction, work being used up in accomplishing this change, just as when weights are raised against gravity, i.e., when their distance from the centre of the earth is altered. 3. That any outside forces acting on the body—a.e. present from the centre of the earth is altered. 3. That any outside forces acting on the body—e.g., pressures in the case of a gas—might have their points of application altered. The two first are linternal effects—the last external. Mayer and Joule both of them applied the principle of the transference of heat into work to air compressed by work. With this substance Joule showed perimentally that the first two effects might be disregarded altogether in comparison with the third. Mayer assumed this without any proof, assumption. The argument of Mayer was therefore only an ingenious speculation—Joule's therefore only an ingenious speculation-

Joule, however, went much farther than Mayer.

Showed by frictional and electro-magnetic

periments of the most varied kind that the

proposed equivalence was an absolute law of

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"In all the action, and Professor Tait saysaction, and Professor last says—in all the scientifically legitimate steps which the early history of the principle records, Joule had the priority. The reader should clearly recognize the priority. The reader should clearly recognize the fact that the experimental foundation of the principle in its generality, and the earliest suggestions of many of its most important applications, belong unquestionably to Joule. Trained to account a experiment and profound testigation in the accurate experiment and profound reflection in the school of Dalton, the pupil has not only immortalized himself, but has added to the fame of the

On the other hand, it appears to Professor Tait just to quote a passage in which Helmholtz, no doubt in view of Mayer's later work as well as doubt in view of Mayers later work as wen as that at the time of the foundation of the science of mechanical effect, thus expresses himself. Mayer was not in a position to make experiments; he was not in a position to make experiments; he was repulsed by the physicists with whom he was acquainted (several years later I was similarly treated), and could scarcely procure room for the publication of his first compressed exposition. You must know that in consequence of these repulses his mind at last became affected. It is difficult now to transport oneself back into the circle of thought of that time and to perceive clearly how absolutely new the matter then circle of thought of that time and to perceive clearly how absolutely new the matter then appeared (25 years ago). It seems to me that even Joule had to struggle long for the recognition even Joule had to struggle long for the recognition of his discovery. Thus although no one will deny that Joule has done far more than Mayer, and that in the early writings of the later many points are not clear, I believe that Mayer must be considered as a man who independently and for himself discovered this thought which has produced the grandest recent advance of natural science, and his deserts are by no means diminished by the fact that simultaneously another, in another country and sphere of action, made the in another country and sphere of action, made the same discovery, and indeed has since developed it

better than he."
Mayer has many titles to the gratitude of scientific men, and one of the chief of them will scientific men, and one of the chief of them will doubt always be his anticipation of the true doctrine of the equivalence of heat and work. Octrine of the equivalence of heat and work. But as it was founded on an experiment which was only sound by chance, in interpreting which he had not seen that his conclusion depended on ne nad not seen that his conclusion depended on one precise answer to a question that had not suggested itself to his mind, it was anticipation and not discovery. Dr. Joule remains the true founder of the modern science of Heat.

## RECENT LAUNCHES.

RECENT LAUNCHES.

I AST Saturday afternoon, the "Active" was successfully launched from the Thames Iron Works. This vessel is a sister ship to the "Volage" which was launched from the same yard a fortnight previously. She is from the designs of Mr. E. J. Reed, C.B., the Chief Constructor of the navy, and is specially designed to keep the sea for a long period. The "Active" is 270ft. in length between perpendiculars, 247ft. length of keel for tonnage, 42ft. breadth extreme, 41ft. moulded breadth, and 15ft. 2in. depth of hold. Her burthen in tons, O.M., is 2,321 59-94, and she will have engines of 600 nominal horse power. With this great power to her tonnage, her minimum full-power speed is expected to be 15 knots. Her armament will be six 6½-ton rifled guns, and two 64-pounders. Messrs. Humphrys, Tennant, and Co., on the same day the serve corrects a Druid".

full-power speed is expected to be 15 knots. Her armament will be six 6½-ton rifled guns, and two 64-pounders. Messrs. Humphrys, Tennant, and Co., are to supply the engines.

On the same day, the screw corvette "Druid" was launched at Deptford Dockyard, in presence of the Princess Louise and Prince Arthur. The Princess Louise christened the vessel in the usual style, and the ship moved down into the water amid the hearty cheers of a large number of spectators. Their Royal Highnesses and the principal visitors drank success to the "Druid," and with this the last of the launches at Deptford was brought to a close. The "Druid" was designed by Mr. Reed. She will be furnished with engines of about 350-horse power. Her burden in tons is 1,322 24-94ths. Her principal dimensions are, length between perpendiculars, 220ft. 0½in., length of keel for tonnage. 194ft., breadth extreme, 36ft.,

each, and they remained sound, except the Palliser, which was cracked in the tube near the muzzle There the experiments ceased for a time, but they are now in progress again. The guns are all of 9in. calibre. The Fraser gun, with thin steel tube, has lately been fired another 500 rounds with battering charges, and remains perfectly serviceable. The First 400 rounds with 30lb. charges, the vent being at the rear of the charge; then 200 rounds with battering charges of 43lb. At this stage the gun was wanted for experiments at Shoeburyness, and was re-vented for the purpose. There it was fired the times with 43lb. charges. Before continuing the test it was decided to do so with the vent in the service position. The gun was accordingly turned round and vented in its previous lower side. It has just completed its third series—500 rounds, this time all with 43lb. battering charges. From the commencement the projectiles have always weighed 250lb., the service weight. The gun has, therefore, fired up to this time 400 rounds with 30lb. charges and 250 projectiles, and 714 rounds with full battering charges of 43lb. English large-grain cannon powder. This makes about 19 tons of powder and 124½ tons of shot. The steel tube is condition for firing. We know of no gun, either the seat of the shot, but remains in excellent worn at the seat of the shot, but remains in excellent to the seat of the shot, but remains in excellent upon to stand such an extraordinary trial on real so severe a test. Indeed, it may be said that no service—certainly not in one war. An Armstrong gun of the Elswick pattern has fired a larger number of rounds, but not so many with battering charges of powder. We shall watch with much interest the further trials of these four guns—the representatives of powder. We shall watch with much interest the further trials of these four guns—the representatives of English designs and manufacturing skill.—

# OUTRIDGE'S EQUILIBRIUM SLIDE VALVE.

OUTRIDGE'S EQUILIBRIUM SLIDE VALVE.

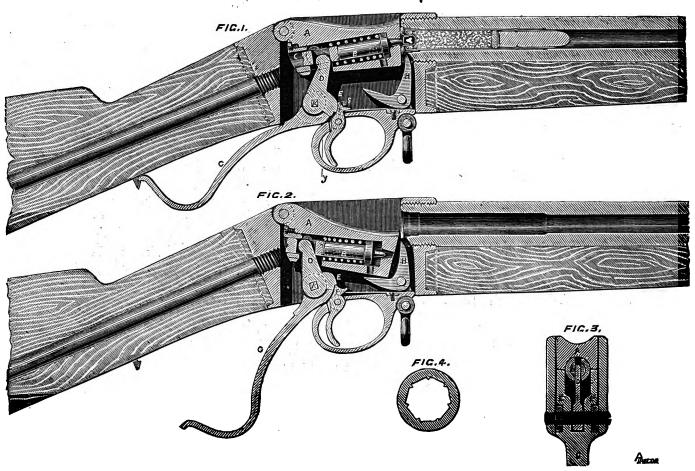
THE trial of the engine on the Isle of Wight (Ryde and Ventnor) Railway, to which Outridge's equilibrium slide valve, described and illustrated in our impression of Friday last, was fitted, took place on Saturday last. We have much pleasure in stating that the engine started without any hitch. The valve spindle was then uncoupled and the valve worked by hand, the regulator being full open, and the pressure in the boiler 100lb. This experiment proved that it worked with perfect ease. The engine was then run to Ventnor and back (26 miles), with a light load, and it also did some heavy shunting, on an incline of 1 in 78. Throughout the trial the valves were perfectly tight, and worked with entire satisfaction. At a future date we intend to give another report, future date we intend to give another report, showing the effect of the valve on the load which snowing the effect of the valve on the load which the engine will pull, and also what effect it has on the consumption of fuel. We congratulate Mr. Outridge upon having effected so efficient an im-provement in the slide valve, and the Isle of Wight Railway Company upon having adopted it.

One of the most interesting natural curiosities in Cornwall, "the Tolmen," or, as it is sometimes called, "the Main Rock," has just been destroyed. It was situate about midway between Penryn and Helston, to the south of the highroad, and weighed about 800 tons. It was 33ft. long, 14ft. high, and 19ft. in breadth, and was of an oval shape. It was placed in a most extraordinary position, and from this fact, as well as its immense size, was an object of much interest to tourists as well as to the geologist. The Tolmen rested on the point of two detached rocks, and underneath it was a free passage. Immediately beneath "the Tolmen" was a valuable granite quarry, which has been worked to the depth of 40ft. close up to the bed where the Main Rock, rested. This has been rented by some one, who, unknown to the proprietor, Mr. Hosken, had a hole bored underneath the rock and charged, and this, when fired, threw the Tolmen off its bed, and caused it to roll into the quarry, 40ft. below. ONE of the most interesting natural curiosities in

when hered, threw the Tolmen off its bed, and caused it to roll into the quarry, 40ft. below.

The Manufacture of Watches and Clocks,—A most interesting and instructive little work, describing briefly, but with great clearness, the rise and progress of watch and clock making, has just been published by Mr. J. W. Benson, of 25, Old Bond-street, 99, Westbourne-grove, and the City Steam Factory, 58 and 60, Ludgate-hill. The book, which is profusely illustrated, gives a full description of the various kinds of watches and clocks, without visiting the above establishments or consulting this truly valuable work. By its aid persons residing in any part of the United Kingdom, India, or the Colonies, are enabled to select for themselves the watch best adapted for their use, and have it sent to them with perfect safety. Mr. Benson, who holds the appointment to the Prince of Wales, sends this pamphlet to any address on receipt of two postages stamps, and we cannot too strongly recommend it to the notice of the intending purchaser.— Advr.

#### MARTINI-HENRY RIFLE.



#### THE MARTINI-HENRY RIFLE.

NHE question of the military arm of the future. which has so frequently been discussed in our columns, appears at last to be definitively settled by the adoption of a rifle bearing the above name. This weapon is the joint production of two inventors—Mr. Martini and Mr. Henry—the breech mechanism of the former and the rifling of the latter having been adopted by the Govern-ment. The progressive steps which have led to the final selection of this arm have been placed so fully before our readers as they were developed, that it is needless here to do more than briefly refer to the circumstance of the competition—the selection of nine breech-loaders from more than a selection of nine oreeon-loaders from more than a hundred which competed, and the apparently final adoption of the arm under notice. We say "apparently," inasmuch as the arm has yet to be tosted in practical use by the troops, a limited number of which will be first supplied with the new rifle. But we have no reason to apprehend that this trial will not lead to its final and general adoption in our army; indeed, judging from the severe tests it has undergone at the hands of the Small Arms Committee, we should say there was no chance of failure on any point.

The breech mechanism, as adopted, we illustrate

in our engraving, figs. 1 and 2, from which it will be seen that it is extremely simple in construction. Fig. 1 shows the breech, closed with the striker forward, and fig. 2 the breech, open ready for loading. The breech block A works on a pin, and contains the striker B, surrounded with its main contains the striker B, surrounded with its main spring. This striker is confined in its chamber by the hollow screw C. The bottom of the breech block is slotted, to allow the end of the tumbler D to engage with the striker. The tumbler is mounted on the axis K, which is squared at the point of contact with the tumbler, so that as the tumbler is raised or depressed the axis moves with it and so alters the position of an indicator outside the look. The hand lever G in its downward it and so alters the position of an indicator outside the lock The hand lever G, in its downward movement, serves to open the breech, and draw back the striker. The tumbler moving with the fiver engages itself on the nose F of the trigger. A further continued downward movement of the lever G acts against the inner face of the hollow screw C, and causes the breech block A to lower itself on its pin as a centre. The upper part of the lever G is forked, and embraces the tumbler as shown

at E E, fig. 3. As the lever is pressed! down, the breech block is opened, and, as it moves, the tumbler is forced back, drawing back the striker, and compressing the main spring at the same time, till the nose F of the trigger engages with the tumbler rest. The object of the tumbler rest is to relieve the trigger from the whole weight of the tumbler and main spring. As the trigger is pressed, its first movement relieves the tumbler from its rest. The whole weight of the spring is now on the trigger, and a further pressure releases it. The working of the extractor is easily understood from a glance at the engraving; but at the same time it will be well to remark that the lower arm of the extractor H is so shaped that the first impact of the breech block with it serves to lossen the cartridge case in

block with it serves to lossen the cartridge case in the chamber; then, as it further descends, the motion of the extractor is more rapid, and the case is ejected clear of the gun. Fig. 3 is a transverse section of the breech block mechanism through the plane x y, fig. 1.

In the early patterns of the Martini system an indicating pin was provided at the back of the breech block and in the upper part of the stock, which projected when the arm was cocked. This indicator was worked by the head of the striker, and as it was found to get out of order, another and more simple indicator was substituted. As mentioned above, this last improvement is fixed on mentioned above, this last improvement is fixed on the end of the tumbler axis, and therefore shows exactly the position of the tumbler. In order to obviate any danger that might arise through carrying the arm loaded and cocked, the committee added a safety bolt S, which engages with

mittee added a safety bolt S, which engages with the trigger, and prevents it being moved. Other minor improvements have been made, such as lightening the cleaning rod, and modifying the shape and position of the sight.

The cartridge for this rifle is the invention of Mr. Henry, and, as it will be contained in a central-fire Boxer case, it is called the Boxer-Henry cartridge. It is 450 gauge, the bullet weighing 480 grains, and is composed of lead hardened with tin. A paper wrapper is placed round the bullet, the edges being returned into a slight cavity at its base. Pure beeswax is used for lubrication, and is placed between three diese made from jute cardboard. The charge consists of eighty-five grains of powder. This cartridge is shown in section in the barrel of the rifle at fig. 1

Turning from the breech mechanism and the

Turning from the breech mechanism and the

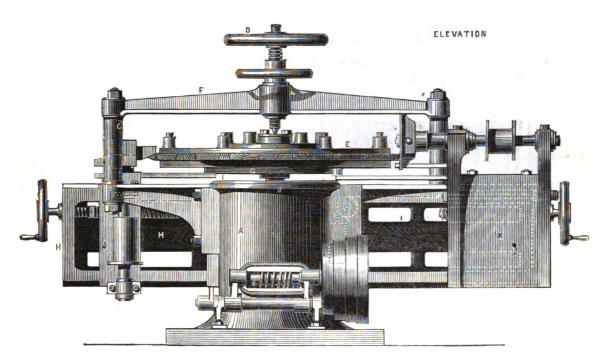
cartridge to the barrel of the new arm, we may observe that it is 35in, in length, and is rifled upon Mr. Henry's principle, shown in section in fig. 4. This is known as the polygonal system, and is seven-sided. Down each angle formed by the intersection of the planes of the polygon is araised rib, which is tangential to the same imaginary circle as that to which the plane sides of the bore are tangential. This form of rifling leaves the bore more cylindrical than any other, except perhaps the Armstrong many-grooved system. In it what Mr. Henry terms a re-entering angle is formed, thus affording to the bullet a bearing at fourteen points instead of seven. The pitch of the rifling is one turn in 22in., the calibre being 450 of an inch. The Henry barrel has proved itself singularly free from fouling, and the excellency of the rifling has fully maintained itself to the last. A rifle on this principle was fired 3,000 times without its accuracy being in the least degree impaired. With the cartridge above described, the Woolwich practice in the latest trials has habiintersection of the planes of the polygon is a raised without its steeling in the least degree managed. With the cartridge above described, the Woolwich practice in the latest trials has habitually given the unparalleled result of lodging the bullets in a square of about 2 ft. at a range of 1,200 yards.

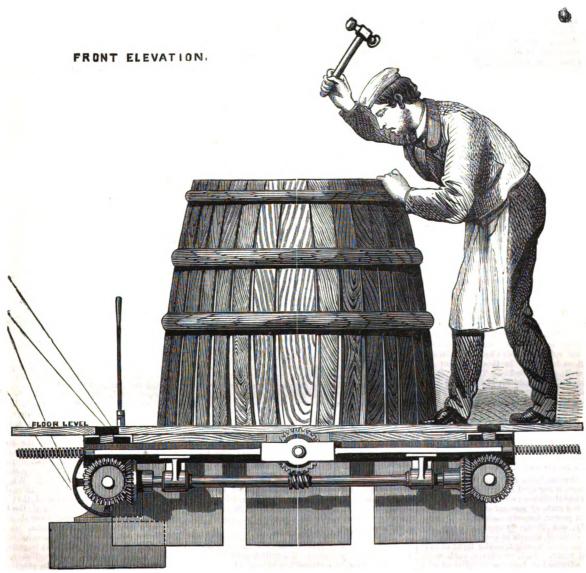
#### CASK-MAKING MACHINERY.

THE accompanying illustrations explain some very simple and effective machinery for trussing and heading casks, which has been lately patented by Messrs. M'Dowall and Sons, of Johnstone, near Glasgow. A pair of these machines have been put to work at a large steam cooperage in Whitechapel, where we saw them in action, and were able to judge of the facilities they afford in that trade. The trussing machine consists of a square, flat cast-iron table, over which move horizontally four curved jaws (changeable to suit the sizes of the casks to be hooped). These jaws are actuated, as is seen in the engraving, by screws passing through bearings at the centre of each side of the square platform. These screws have a very slow and simultaneous forward motion imparted to them by worm gear, and as they cause the jaws to advance they close the staves gradually till they are narrow enough for the trusses to be placed on them. Before this can be effected, however, the cask must be turned, and, therefore, THE accompanying illustrations explain some vever, the cask must be turned, and, therefor a temporary iron hoop, which opens with a kind of

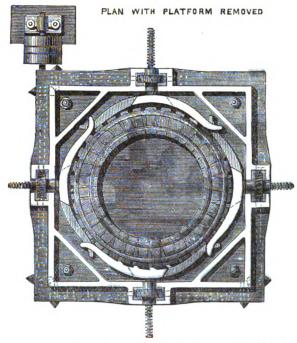
### CASK-MAKING MACHINERY.

BY MESSRS. McDOWALL AND SON.





#### CASK-MAKING MACHINERY.



ratchet clasp, is placed round the cask till the truss which passes over this hoop is driven down. The main peculiarity in this machine consists in the fact that the operation is carried on on a clear open platform, so that the workman can get all round the cask to hammer out and adjust the staves as they close in, securing an even arrangement of them, which was impossible, or only left to chance machines. The "heading," or caskhead turning machine, is of a type long in use, though, in this instance, beautifully designed and finished, and having in two particulars special improvements. The first of these consists in the use of spring studs passing through the upper table E, which, when clamped down on the boards to be shaped for a cask-head, press on and hold each board, even if their thicknesses are unequal. By this means, loose boards roughly sawn out can be placed in the machine without being dowelled, as was heretofore necessary, previous to rounding and "canting." The second peculiarity possessed by this machine consists in the method adopted of oval or "full" canting, so as to allow for the greater contraction of the wood across the grain than lengthwise. This is effected by means of a cam-wheel lying under the revolving table G on which the work is fixed, from which a slight horizontal motion is given to the head-stocks carrying the saw at one side, and the cannelling tool at the other. As the eccentricity required is very slight, the motion imparted to these tools does not affect the working of the straps.

#### THE SEA TORPEDO.

THE SEA TORPEDO.

We have received the following copy of letter on the subject of sea torpedoes, and a request for its insertion in our columns, from Captain J. Harvey, R.N., with whose invention in this direction our readers are well acquainted:—"To the Right Honourable Hugh C. E. Childers, M.P., First Lord of the Admiralty. 5, Keynsham Parade, Cheltenham, March 6th, 1869. Six,—As the Navy Estimates and our Navy Policy are about to be debated in the House of Commons, i venture to request your attention to a mode of naval warfare, which will be that of future combat upon the ocean; I am urged to so do, under a belief, which is shared by others who have studied with me the subject, that it is one of great importance to so maritime a state as England.

"I allude to the employment of the Sea Torpedo.

"I allude to the employment of the Sea Torpedo "I allude to the employment of the Sea Torpedo. Many years since, it engaged my attention, as it did also some other naval officers; seeing, as we did, that, in the then altered state of navigation by the introduction of steam power, torpedoes admitted of being easily, certainly, and effectively applied to the disabling or destruction of vessels at sea; and this, too, under any condition of weather, in the light of day, or darkness of night. And, moreover, such work of destruction admitted of being accomplished at a trifling cost, and with impunity also, by fast and handy vessels of comparatively small size, of light equipments, and inexpensive requirements; vessels that can keep long at sea, by reason of great available stowage for coal; having, too, the essential qualities of being excellent sea boats, and of speed under canvas. Such vessels could choose their time

under canvas. Such vessels could choose their time and opportunity of attack, which, as a rule, would be under cover of darkness of the night.

"By the late American conflict we were brought to a knowledge of the destructive capabilities of torpedoes. In that conflict of the war vessels disabled, or destroyed, about three-fourths were so disposed of by torpedoes: cannon were comparatively incorative.

disposed of by torpedoes: cannon were comparatively inoperative.

"Though the torpedoes were used disadvantageously, that is to say, passively, they nevertheless did, in most cases, the work of destruction effectively. But in future wars, they will be used actively or offensively; they will be brought into contact with the vessel attacked, and when in contact they will, by self-action, explode. Such mode of application will doubtless be that which will be generally practised in the present state of perfection enerally practised in the present state of perfection

of the arm.
"Looking into the history of torpedoes, it is some "Looking into the history of torpedoes, it is some-what extraordinary, indeed incomprehensible to those who are acquainted with their capabilities, that our naval authorities should apparently be so oblivious as to the occurrences in the late American war; and that they should continue to build monster war ressels, at an enormous cost, when, guided, as they should be, by established facts, as to their ability or inability to endure violent shocks of properly and suitably charged torpedoes. War vessels that we now have, and others in course of construction, will prove, there is reason to believe, worse than useless against vessels armed with sea torpedoes; for they would in all probability attend the sinking or destruction of such monster vessels at sea, where it would be hardly possible to save their crews.

"The Americans had not a knowledge of the sea

to their being published; so to lead to its thorough

to their being published; so to lead to its thorough investigation, which, I am constrained to say, has been hitherto withheld by the Government authorities.—I have the honour to be, Sir,

"Your most obedient Servant,

"John Harver, Captain, R.N.
"The Right Honourable Hugh C. E. Childers,
M.P., &c., Admiralty."

# THE NATIONAL BOILER INSURANCE COMPANY.

THE NATIONAL BOILER INSURANCE COMPANY.

WE have received the annual report of Mr. Henry Hiller, Chief Engineer to the National Boiler Insurance Company, whose head quarters are in Manchester. In this document are the following notes on the construction and management of boilers, which will interest many of our readers and may prove of practical value to some:—My Report for 1867 contained some general remarks on the construction of boilers. I now propose to refer to a few matters suggested in the course of our inspections bearing on the same subject and to others relating to the management of boilers. Many new boilers proposed for insurance are found of most inferior description, owing to mistaken notions of economy on the part of the purchasers, or to ignorance of the makers. Bad material, bad workmanship, bad form, insufficient staying;—some, or all of these, render many boilers quite unfit for the work proposed. The cylindrical egg-ended externally-fired boiler is still used extensively, although less safe, and requiring much more fuel than the internally-fired two-flued Boiler. The cheapness of fuel at collieries, and the simple form of this boiler, have caused it to be preferred at such works; whilst the objection to other classes has arisen, in many cases, through the ignorance of those entrusted with their construction, setting, or fitting up; or through subsequent gross mismanagement.

In some instances where plates have been renewed,

agement.
In some instances where plates have been renewed, In some instances where plates have been renewed, the holes were found to have been carelessly punched, and the "drift" so forcibly used that the old seams were partially or wholly fractured before the boiler was re-started; whilst the distorted holes were filled with huge, irregularly-siaped rivets. The danger of such practices is too evident of require comment. I would strongly advise that not only new work, but all repairs, should be executed by none but really good workmen; and with externally-fired boilers especially, the old seams of rivets should be cut off and new holes drilled. This course not only insures sound work, but also shews whether the old plates are good, or brittle and unreliable. If the holes in the two plates do not correspond, they should be carefully "rimered out," and suitable rivets inserted. "Drifting" should be studiously avoided, and if the seams are carefully laid, but little caulking will be requisite. With new boilers, or where extensive repairs have been executed, it is advisable to carefully and the hydraylic test, so that lankages if be requisite. With new boilers, or where extensive repairs have been executed, it is advisable to carefully apply the hydraulic test, so that leakages, if they exist, may be made good before the boiler is they exist, bricked in.

bricked in.

The advantage of riveted-joint beds for fittings and at manholes has been frequently urged in my reports. The insurance of a boiler was recently declined, the plates of which were only 5-16in. thick; whilst the unstrengthened manhole was no less than 18in. in width. The ends of some Boilers are so rigidly secured as to lead to serious fractures, whilst just here the straying is as slight that the are so rigidly secured as to lead to serious fractures, whilst in others the staying is so slight that the ends bulge outwards, and in many cases fail with disastrous results. Gusset plate stays riveted to stout angle iron are an efficient stay; but where longitudinal stays are preferred, they should be of large diameter, and secured by stout puts on each side of end pates, instead of by slight cottars or pins passing through angle iron. The risk of explosion of externally-fired boilers would be much reduced if they were strengthened by stout longitudinal stays.

destruction of such monster vessels at sea, where it would be hardly possible to save their crews.

"The Americans had not a knowledge of the scattorpedo in its present state, as to form and offensive application. They used torpedoes, with few exceptions, passively; that is, they were stationed in such positions which afforded the best chance of hostile vessels coming within their sphere of action: such applications of them is very costly and uncertain; also, unless placed in close proximity, requiring large numbers; and if fired by electricity, necessitating complicated and expensive arrungements.

"If a war should arise between maritime States, the sea torpedo will most assuredly perform a prominent part in the conflict. And if England should be involved in the calamity, those to whom her defences are intrusted will have to deal with the sea torpedo, since their pleasure, in the employment of such arm, will not be consulted by the war authorities of other States. Hence the policy of being prepared with vessels adapted to the service of the arm in question, and the necessity of officers being thoroughly well instructed in its every detail, and practised in its application.

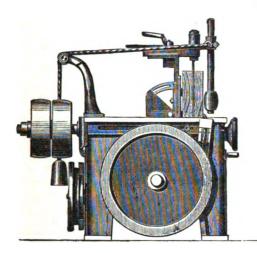
"As this is a matter which not only concerns you, as the Chief of our Naval Administration, but one also that greatly concerns the British public, involving, as it does, the protection of our shores, and more especially the protection of our shores, and more especially the protection of our shores, and more especially the protection of our commerce, laws therefore, in this letter, expressed freely, and I trust respectfully, my opinions upon it, with a view plesion of externally-fired botters would be much reduced if they were strengthened by stout longitudinal stays.

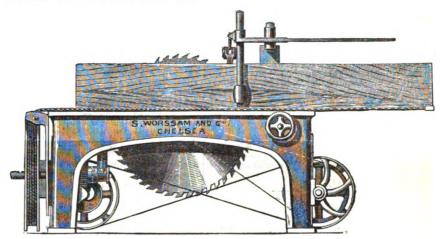
Several instances have been reported where boilers were seriously injured by overheating, through the external flues being carried above the low-water level. All flues should be so arranged that the plates may be quite covered by water; and in every case, even with small boilers, they should be made large enough to permit a man to pass along for inspection, &c. This can be arranged without affecting the efficiency of the boiler. Some boilers are so set, that a large portion of the lower part of the shell is buried in brick work; and plates so hidden sometimes become dangerously thinned before the corrosion is detected. Where it is not desired to use the side or other external flues, they should be so built and arranged that they may be entered for thorough inspection of the boiler. The seatings, &c., should never exceed 4½in. breadth where in contact with the plates, so that defects may not be hidden. The defects to which fittings are liable are briefly illustrated in preceding pages. Those of the very best construction and materials are not only most reliable, but in practice really the cheapest.

The safe and economical working of boilers de

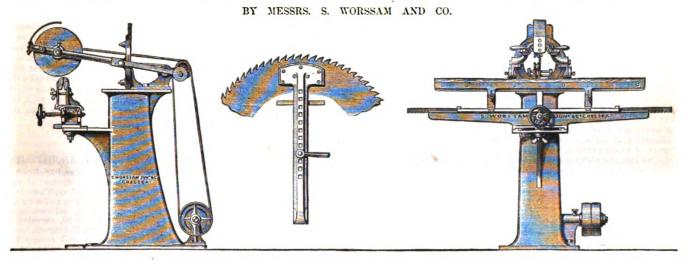
#### IMPROVED SELF-ACTING SAW BENCH.

BY MESSRS. S. WORSSAM AND CO.





#### SAW SHARPENING MACHINE AND CIRCULAR SAW-VICE.



managed by those in charge, that a few notes thereon will be of service. The advantages of regularity and steadiness in the working of all boilers cannot be over-estimated. Economy of fuel and increased production of steam always result therefrom, whilst the liability to defects of any kind is materially reduced. The fires should never be allowed to burn low, but the rate of combustion should be regulated by the damper. The dangerous practice of throwing open the fire doors to reduce the pressure should never be resorted to, as it is not only attended with great waste of heat, but positive danger, especially with externally-fired boilers, owing to the sudden cooling and contraction of the highly-heated plates. Uniformity of water-level and of steam pressure are indispensible. Thick fires are more economical than thin ones; the fuel on the bars may be from 8in. to 12 in. thick, according to the size of the furnaces; and by adopting the "coking" system of firing. i.e., pushing the fire towards the back end of the furnace, and throwing on the fresh fuel at the front, smoke may generally be easily prevented by the due admission of air through suitable perforations in the furnace door.

Where boilers are over-worked, or the fuel used

generally be easily prevented by the due admission of air through suitable perforations in the furnace door.

Where boilers are over-worked, or the fuel used is of such quality that the coking system of firing may be inapplicable, they may be fired in the ordinary way, the fuel being spread evenly over the whole grate surface. In such cases the admission of air at the door may be found insufficient to altogether prevent smoke, and necessitate the insertion of a perforated plate under the bridge; a second bridge being built a short distance behind the ordinary one, with an inverted brick bridge between the two. This plan I have recommended with good results. I may here note that fire-grates are often unnecessarily long; comparatively short grates are generally preferable and more economical. Heating the feed water by means of "Economisers," &c., is advantageous, as the temperature of the water in the boiler is thus more equalised, and liability to unequal straining of the seams, &c., reduced. Where water is heated by exhaust steam from the engine, this steam should not mix there-

with, as the grease from the cylinder often combines to form a deposit inside the boiler so fed, which has frequently caused serious damage. The plan of delivering the feed water in a horizontal direction, near the surface of the water, has been explained in previous reports; recent experience has still further illustrated the necessity for its adoption. Many boilers suffer seriously from the sediment deposited by the water. Where the use of bad water is unavoidable, I would advise that means be taken to precipitate the sediment in tanks before it enters the boilers. If the deposit is of a muddy character, a large settling reservoir, or filter bed, will be serviceable. The corrosive effect of acid water should be neutralised before passing it into the boilers. In order that the desired object may be effected with certainty and economy, the water should in each case be subjected to careful analysis by a competent chemist. Boilers about to be cleaned should be allowed to cool down before the water is let out. Neglect of this may lead to fracture of the seams, and render the scale more difficult of removal. with, as the grease from the cylinder often combines

#### WOOD WORKING MACHINERY.

MESSRS. S. WORSSAM AND CO., of the Oakley Works, Chelsea, have just issued a trade catalogue, which is well worthy of rather more than a passing notice. It is becoming the custom of engineering firms to issue something more than the mere trade price-list of former times We now have by us several examples of judiciously arranged catalogues, which give information upon the subject of the special manufacture which it is the object of the catalogue to advertise. The latest addition to these is Messrs. Worssam's, in which we can investigate the most recent improvements in the various machines in use for wood-working, and, at the same time, have rules placed before us for calculating the diameters of riggers and speed of shafting best adapted for the machinery illus-

trated. Besides this, there are rules in connection with the working of steam engines, which may be found useful in the absence of more special works. To enumerate all that Messrs. Worssam's catalogue contains, would be to detail the contents of some sixty well filled and amply illustrated pages. It will, therefore, be more to our purpose and to the interest of our readers to generalize the productions of Messrs. Worssam and Co., and to illustrate one or two items worthy of more special notice. The machines for which this firm has been so long and justly celebrated are saw frames, saw benches, builders and joiners' machinery of every kind, band saw machines, planing and moulding machines, machinery for railway plant, steam engines, &c. To these we may now add machinery for working in stone, marble, and slate, as well as sundry other apparatus.
We have selected for illustration Messrs. Wors-

sam and Co.'s improved acting saw bench with rope feed, and their saw sharpening machine. The saw bench is adapted for cutting logs, planks, deals, battens, &c., and is provided with an improved self-acting rope-feed motion, for advancing the timber to the saw. When cutting long stuff, carriages, running on rails at each end of the machine, are used to support the overhanging ends. The main standard of the machine is cast in ) a > piece, and the drum, around which the rope winds, being of larger diameter than usual, revolves less quickly, and, consequently, the injurious strain and twist on the rope are much reduced. To keep the stuff well up to the fence, a pressure lever with rollers and weights is supplied with each bench. The rate of feed may be varied from 15ft. to 60ft. per minute, according to the nature of the timber under operation. The object of the saw sharpening mechine we have illustrated in to leave as much machine we have illustrated is to lessen as much as possible the cost of saw sharpening, which forms so considerable an item in saw-mill expenditure. The file is almost entirely dispensed with, and a

disc of consolidated emery employed. The disc revolves on a spindle, carried by a counterbalanced arm that can be set to various angles, to suit the form of tooth required, and for gulleting, topping, bevelling, &c. For sharpening mill-saws, a long vice, with compound table, is affixed to the forepart of the machine, and is subject to the several variations of position necessary to bring each tooth When of the saw within reach of the cutter. circular saws have to be sharpened, the mill-saw vice is removed, and replaced by one shown in the We understand that this machine is coming into extensive use, on account of the saving effected in time, labour, and files. One man, with the machine, will do nearly as much work as six with the file by hand. The disc is inexpensive, and its average duration in constant action is about two The catalogue from which our extracts are made is exceedingly well got up, and should be consulted by all who require machinery of the above class.

# ELECTRIC TELEGRAPHY IRRESPECTIVE OF TELEGRAPHIC APPARATUS.

By Mr. E. G. BARTHOLOMEW.

(Concluded from page 193).

THE conductor of a submarine cable is invariably copper. It has been attempted to introduce those wires whose function is to take the strain off the copper into combination with it, and so by increasing its area to reduce its resistance, but this has only been done experimentally, and is not regarded with favour. It may therefore be assumed that the conductor is in all cases copper. Its high specific conductivity permits of a small section, and the small surface which this involves means decreased inductive area-a point which has been shown to be of paramount importance. weight of a copper strand of 7 wires-6 round 1is as compared with a solid wire of equal diameter, as 54 to 69.

The conductivity of copper varies immensely, the difference being traceable entirely to the admixture of foreign matter. Pure copper being regarded as 100, the addition of 2.45 per cent. of silver—an equally good conductor—conductivity to 82.52. An addition of reduces its An addition of 5:4 per cent. of arsenic, a metal frequently found in combina-tion with it, roduces its conductivity to 6.42. Some specimens of Spanish coppor, owing to the presence of arsenic and other impurities, conduct no better than iron. The existence of these facts has pointed out the necessity for adopting a standard of R in testing copper for electrical purposes. What this standard is may perhaps scarcely be said to be definitely settled yet. It has engaged the attention of a committee of the British Asso-ciation for several sessions. The standard of R in former use was equal to one mile of No. 16 copper wire pure, which was regarded as a unit, but the British Association has deemed it advisable greatly

to reduce this unit of measurement.

Whatever standard isadopted, temperature must be carefully considered. A rise of 4 deg. Fah. causes a loss of 1 per cent. in the conductivity of copper. Alloys vary very much less under changes of temperature than pure metals, and hence an alloy is the best material to employ in the construction of a standard, or in the making of artificial resistances. German silver, an alloy of copper, nickel, and zinc, is an excellent material for the purpose.

All cable cores-by which are meant the conductor and its insulating wrapper only-both before and after covering them, should be kept submerged at a temperature as nearly that of the ocean at great depths as possible; this is 39deg. Fab. By the adoption of this precaution, faults occurring during the manufacture are at once detected. The desirability of keeping the completed cable permanently submerged is shown from the fact that the Malta and Alexandria cable of 1861, covered with 18 No. 11 iron wiros, was coiled after completion into leaky tanks, the water being occasionally renewed. The iron sheathing was, therefore, alternately wet and dry, and the result was such a rapid oxidization of the metal that it generated heat to the extent of 86deg. Fah. Such a result should be carefully avoided, because, if gutta-percha be employed, it becomes soft at high temperatures, and if in this state the core is bent, the copper strand is liable to become decentralized, even if it does not-as has more than once occurred-altogether protrude from the gum.

The uncovered core of a cable should never be subjected to a high strain. If stretched, the copper will permanently elongate, whilst the percha will,

to a certain extent, return to its former length. The result of this is that the copper will buckle, and alter its position. If the outer wires are on the elongation is presented to any serious extent. With respect to the elongation of iron wire, it may be mentioned that No. 8 gauge will vary from 10.5 to 11.16 per cent. before it breaks. The softer the wire the more it will elongate, and the less strain it will bear.

Subterranean wires, it has been shown, being under the same laws of induction as submerged wires, manifest the phenomenon to an equal extent. The conductor is always copper, covered either with gutta-percha or india-rubber, and prospirally and passed through tar, and plentifully sprinkled with sharp sand before the tar solidities. The sand adheres to the surface embedded in the tar, and forms an admirable protection to the whole. If the wire in this state b brick, it will saw the brick in two. If the wire in this state be drawn over a

It is usual to protect buried wires, when laid under streets, by drawing them through iron pipes, but, in country roads, a stout wooden guttering may be sufficient. An economical plan, and one which answers well in some localities, is to take out a trench about 18in. deep, and to sift a portion of the thrown out soil back into the trench, then lay in the covered wires, and sift over them another portion of soil, laying upon this the larger and flatter stones, over which the remainder of the soil may be thrown and rammed in.

The advantage of test boxes at intervals along a length of buried wires is doubtful. They may, and do, present facilities for dividing the circuit without breaking the wire; but every test box is more or less a source of leakage, a loss of insulation. Ground test boxes are decidedly objectionable; upright boxes are better. The position of a fault, not of continuity, but of insulation, may be very closely calculated, provided the elements of the core are well known previously. It resolves itself into a question of R, which is proportionate to distance.

A few general remarks upon the submergence of cables may be instructive. This is an operation in which too much care cannot be taken. Remembering that whether the operation be a long or a short one, every moment of the time the cable is going overboard is a moment fraught with risk to the enterprise, it is evident that no precaution should be omitted, the neglect of which would endanger the cable. Every means should be adopted to prevent a stoppage in the paying out, or even a diminution in the speed of the cable, and the deeper the water, the more urgent is this pre-Great attention must be paid to the dynamometer, so that, the breaking strain of the cable being known, an ample margin may be given the brakes. But, after all, no positive rule can be laid down for the paying out of a cable. A man of ability will adapt his arrangements to the requirements of the situation, which will vary with weather, depth of water, and casualties which may, and indeed must arise. A general rule may, however, be laid down which applies particularly to great depth of water, which is, that the safety of the cable when being paid out is increased by an increase in the ship's speed, provided always that the staff of cable men can keep pace with the speed at which the cable travels. The more rapidly a cable leaves the ship, or rather the more rapidly the ship leaves the cable behind, the greater will be the angle between it and the perpendicular over the stern. The cable lies more horizontally upon the water, it sinks less rapidly, and requires less pressure to be applied to the brakes. self-evident conclusions.

The successful laying of cables in 2,400 fathoms, and, above all, their successful recovery in like depths, affords a sufficient proof that no difficulties, not surmountable, need be feared in the laying of any future cables in fathomable depths; but when we come to speak of the permanence of cables, however successfully laid, the aspect of things becomes changed. No guarantee can be given in this respect.

The character of the ocean's bed varies immensely. In the Mediterranean, the unevenness and inconstancy of the bottom in the volcanic area has proved singularly fatal to the continuance of cables. On this account, great judgment is needed in the selection of a suitable route by careful pre-vious soundings. The bottom of the Atlantic between Ireland and Newfoundland proved to be eminently adapted to the reception of a cable. For 28deg. of longitude the depth of water varied, with

upon a microscopic examination, to consist of minute shells. The presence of these shells has been regarded as a satisfactory proof that at the great depths of the ocean the water is in a state of rest, and that any cable being once laid there will remain undisturbed. The landing place of a cable is, however, a different thing altogether. However strong and well protected in itself the shore end of a cable may be, it cannot withstand the incessant beating of heavy waves upon a rocky coast. The Channel Islands telegraph cable is a remarkable instance of this fact. It may often be advisable to deviate considerably from a direct line in order to secure a better and more sheltered spot for the landing. But it is not only close to the shore that a cable is in danger. Even in water of from 100 to 200 fathoms a cable is not secure from the abrasion of icebergs of high specific gravity, and there seems little room to doubt that the only accidents which have occurred to the present Atlantic cables are due solely to these monsters

A rapid tideway should be avoided for the bed of a cable. The rust, which unavoidably forms upon the external wires, instead of accumulating and in time preventing further corrosion, becomes washed off, until the entire wire is gone. In some situations, cables become silted up with sand and shingle, and cannot then be raised for repairs. The adhesion of weed, coral, and other marine organisms, is detrimental to a cable, as facilitating its corrosion. The cable across Bass's Straits was actually floated by the mass of weed which enveloped it, although this cable weighed two tons per mile. Lastly, as far as possible, any frequented roadstead should be avoided, for a ship's anchor is a deadly enemy to telegraph cables, and all notices as to anchoring will stand for nothing in a gale of wind, setting on shore. The only remedy for this, if such a locality cannot be avoided, is to take the bull by the horns, and put down a cable to which any ship of ordinary tonnage may ride with the risk rather of breaking her own rope than the telegraph cable.

#### INSTITUTION OF NAVAL ARCHITECTS.

THE meetings of the Institute of Naval Architects, Session 1869, will be hold in the hall of the ociety of Arts, John-street, Adelphi, on Thursday, Society of Arts, John-street, Adelphi, on Thursday, March 18, morning at 12, and evening at 7 o'cleck; on Friday, March 19, morning at 12, and evening at 12 orly. The Right Hon. Sir J. S. Pakington, Bart, M.P., G.C.B., D.C.L., President, will occupy the chair. The council of the Institution will meet in the library of the Society of Arts at 11 a.m., on Thursday, March 18; and at 11 a.m. on Saturday, March 20.

Thursday, March 18; and at 11 a.m. on Saturday, March 20.

The following is a programme of proceedings, which, however, is issued subject to revision:

—Thursday, March 18.—Morning Meeting at 12 o'clock.—1. Annual report of the council. 2. Address by the president.

The following papers will then be read and discussed:—1. "On the Law of Resistance of Armour cussed:—I. "On the Law of Resistance of Armour Plates, composed of one or more thicknesses." By William Fairbairn, Esq., C.E., LL.D., F.R.S., Honorary Associate. 2. "On the Iron Floating Dock at Carthagena." By George R. Rennie, Esq., M.L.C.E., Associate. 8. "On Floating Docks." By Edwin Clark, Esq., C.E. 4. "On a Project for a Floating Dock." By Charles H. Wigram, Esq., Member of Council.

Member of Council.

Evening Meeting at 7 o'clock.—1. "On the Calculation of the Stress in Propeller Shafts." By W. J. Macquorn Rankine, Esq., C.E., LL.D., F.R.S., Associate Member of Council. 2. "On the Resistance opposed by Water to the Motion of Vessels of various forms, and the way in which this varies with the velocity." By John Isaac Thornycroft, Esq., C.E., Associate. 3. "On Railway Communication across the Sea." By John Scott Russell, Esq., F.R.S., Vice-President.

tion across the Sea." By John Scott Russell, Esq., F.R.S., Vice-President.
Friday Morning, at 12 o'clock.—1. "On Long and Short Ironclads." By E. J. Reed, Esq., C.B., Vice-President. 2. "On a New System of Ironclad Vessels." By Herr Josef Romako, Chief Constructor of the Austrian Navy, Member. 3. "On the Hydraulic Steering Apparatus now being fitted to H.M.S. 'Achilles.'" By Captain Inglefield, R.N., F.R.S. 4. "On the Steam Steering Apparatus, fitted in the 'Great Eastern,' and H.M. Ships 'Northumberland' and 'Monarch.'" By James Mac Farlane Gray, Esq.

'Northumberland' and 'Monarch.'" By James Mac Farlane Gray, Esq.
Friday Evening, at 7 o'clock.—1. "On the Qualities of Boiler Plate." By S. M. Saxby, Esq., R.N., Associate. 2. "On Liquid Fuel." By Captain Selwyn, R.N. 3. "On a New Life Buoy." By Staff-Commander Bourchier, R.N.
Saturday Morning, at 12 Selector.

Saturday Morning, at 12 o'clock .-- 1. "On Copper very trifling exceptions, from 2,000 to 2,300 fathoms, and the bottom, with equally trifling exceptions, consisted of a species of ooze, found,

Member of Council. 2. "On the Location of Inde-



pendent Steam, Fire, and Bilge Pumps in Steamers."
By Charles H. Haswell, Esq., Associate.
The above programme only reached us on Monday last, and of course several of the papers will have been read by the time this reaches our readers. We shall, in our next, commence our usual notice of the subjects discussed. subjects discussed.

# THE COAL AND IRON WORKS AT ROUND OAK.\*

THE COAL AND IRON WORKS AT ROUND OAK.\*

THE Earl of Dudley's iron works at Round Oak are situated on the high road between Dudley and Brierly Hill, and are, without doubt, the most and Brierly Hill, and are, without doubt, the most complete in South Staffordshire, regularly turning out a quality of iron unrivalled by, if not superior to, the production of any works in the Black Country. We arrive at this great establishment by the West We arrive at this great establishment by the West We arrive at this great establishment by the West Which runs parallel with one angle of the works. Midland division of the Great Western Railway, which runs parallel with one angle of the works, which runs parallel with the North-Western Railway, and twelve locomotive engines are employed to serve these works, thereby rendering assistance also over 40 miles of railway, which traverse his lordship's collieries. The works, together with the offices, &c., cover 30 acres of land, and they are capable of turning out from 500 to 550 tons of best finished iron per ing out from 500 to 550 tons of best finished iron per week. There are nine steam engines in the mills and forges, all working vertically or horizontally, and are very large steam hammer, with the last improvements, which is capable alike of dropping a 20-ton blow or cracking a nut without bursting the kernel. Here they have four large forge hammers or helves, and this is the only method adopted to form the puddled balls into blooms or slabs, as they may be required. Old fashioned shingling is the practice here; neither squeezers nor patent shingling of any kind is resorted to.

There are five rolling mills—one 16-inch plate

Here they have four large forge hammers or helves, and this is the only method adopted to form the puddled balls into blooms relabs, as they may be required. Old fashioned shingling is the practice here; neither squeezers nor patent shingling of any kind is resorted to.

There are five rolling mills—one 16-inch plate mill, a 12-inch ditto, an 8-inch and 7-inch bar mill, in these works—is admirable for its extent and convenience. The speeds are higher than anything in South Staffordshire, and the machinery, by its quiet and steady motion, forcibly reminds one of the saying that the construction and perfection of the saying that the construction and perfection of the saying that the construction and perfection of the saying which drives all the mills and forges supersedes gear which drives all the mills and forges supersedes gear which drives all the mills and forges supersedes gear which drives all the mills and forges supersedes sity is very rapid, but the sound resembles the engines run fast, the nut on the fly shaft of necessification in the saying should be a selegic hammer of the cap work of the superseder in the control of metal with metal in their constant revolutions. Where no head with the truth of all the driving wheels are large, and as the head of the saying sounds like a sleege hammer on the cog of a wheel, which are generally heard in the or works of the Black Control. We were much struck with the truth of all the driving wheels; indeed, the general lines of the work reminded us of a parallel, general lines of the work reminded us of a parallel, and the properties of the securities distribution of metal in their orners and rightly placed. We could not always square and rightly placed. We could not always square and rightly placed. We could not always square and rightly placed. We could not alway square and rightly placed. We could not heating furnaces, mich as for mills and the microw wheels and schemiding struck whe shall private and conomic and the works propers.

The bulldog is calcined exclusiv

coal, metal, &c., by rail, back and front, as described above, and the puddled bars, billets, &c., are removed by rail, with locomotives, into the mills, which are at some little distance, for consumption.

It must be observed that the whole of the pig ron or plate iron consumed is made from the Earl of Dudley's mines, raised on the estate, and smelted at his own blast furnaces. Nothing is used but his lordship's 10-yard coal, which is doubtless the best lordship in the works, are justly famed for the manufacture of iron works are justly famed for the manufacture of great works are justly famed for the manufacture of large rounds and squares. Rounds are rolled here as large rounds and squares. Rounds are rolled here as high as 64jin. diameter down to 7-wire gauge; and high as 64jin. diameter down to 7-wire gauge; and the higher sizes of rounds are in general request at the higher sizes of rounds are in general request at the higher sizes of rounds are in general request at the higher sizes of rounds are in general request at the higher sizes of rounds are in general request at the higher sizes of rounds are seen and superior quality of the compactness are made with facility. Find the rounds are removed and feather-edged down to 2in. by 1in.; likewise channel iron, from down to 2in. by 1in.; likewise channel iron, from of the rounds are properly iron, or in other words, double-angle iron; square-edged and feather-edged iron, beat properly iron, or in other words, double-angle iron; square-edged and feather-edged which up to this time has not been rolled at any which up to this time has not been r

renders its adoption desirable where it can be obtended as the sumest have been carried for some hundreds of miles on the backs of the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that can be at the superiority of the materials raised in his own estates, and coak works, at the Round Oak Works.

Works.

The Earl of Dudley's finished iron is largely consumers the sup son to canton. Foo-chow-foo, be not permitted and you have and you have a supplied the almost unexplored regions of Thibet are supplied, so the almost unexplored regions of Thibet are supplied, so the almost unexplored regions of Thibet are supplied, so the almost unexplored regions of Thibet are supplied, so the almost unexplored regions of Thibet are supplied, so the almost unexplored regions of Thibet are supplied, so the supplied of the permitted of the backs of the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of that country. The superiority of this marvellous iron is owing, no doubt, to the attennated mules of the at

The Round Oak Works were founded by the late Mr. Richard Smith, who for thirty years was faithfully and successfully engaged in developing his lordship's coal and mineral empire. The tact, talent, and transcendent business abilities of the late lamented Mr. Smith were well known and appreciated in the iron trade. Mr. Frederick Smith, the present in the iron trade. Mr. Frederick Smith, the present St. John's, Oxford, but obtained immense practical knowledge under the guidauce of his late father; and as he inherits the business qualities of his father; the efficiency of the management continues unabated. Probably a greater willingness is evinced to adopt all modern improvements and adapt these great manufacturing operations to the requirements of the day, keeping abreast in all departments with the rapid progress of the iron age in which we live. Works.

The Round Oak Works were founded by the late
The Round Oak Works were founded by the late

# A NEW TANK LOCOMOTIVE.

A NEW TANK LOCOMOTIVE.

A LOCOMOTIVE with some novel features, designed and patented by Mr. M. N. Forney, designed and patented by Mr. M. N. Forney, at the Hinkley and Williams Works in Boston, has recently had a trial on the Chicago, Burlington and recently had a trial on the Chicago, Burlington and Railway In designing this engine, says the Quincy Railway. In designing this engine, says the American "Railway Times," Mr. Forney has aimed to secure some decided advantages over the common locomotive, by a better distribution of the weight on the wheels, and it is claimed that he has accom-

witching engine, weighing 20 tons, will draw as much as an ordinary eight-wheeled truck engine, weighing 30 tons. The weight of the switching obvious; as the whole weight wheeled truck engine, weighing 30 tons. The weight of the switching engine is carried by the four driving-wheels, whereas only about two-thirds of the weight of the eight-wheeler is on the driver, the other third being carried wheeler is on the driver, the other third being carried on the truck. It might, therefore, very naturally be asked, why the four-wheelers are not used for general afreight business? The shortness of the wheel base, and consequent unsteadiness of the engine on the track is the great difficulty. Mr. Forney has aimed to secure a long wheel base, and at the same time, retain all the weight of engine and boiler on the drivers. To do this, he has arranged the engine proper, exactly as a common four-wheeled switcher, and then extended the frames beyond the firebox, which is carried on a four-wheeled switcher, and then extended the frames beyond the firebox, and then extended the frames beyond the firebox, and then extended the frames beyond the firebox, the which is carried on a four-wheeled switcher, and then extended the frames beyond the firebox, and then true to create a prejudice against the engine; sight, is apt to create a prejudice against the engine; sight, is apt to create a prejudice against the engine; but the objections to this crab-like movement are but the objections to this crab-like movement are bring in the opposite direction.

First, and most important of these, is the fact that the truck—which can adjust itself to the curvature of the going of Mr. Forney's engine.

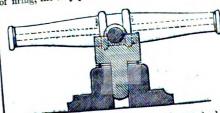
First, and most important of these, is the fact that the truck—the damped of the product of the product

# Correspondence.

A TWIN GUN.

A TWIN GUN.

SIR,—Enclosed I beg to send you a design for au 8-inch twin gun, 11ft. length of bore, which may be of cast or wrought iron in one solid mass of metal. It is mounted on trunnions as usual, and has a pin swivel or other turntable. The advantages of this swivel or other turntable. The advantages of this gun are that one barrel is charged instantly on the discharge of the other. The fire, therefore, will be at least as quick as that of any breechloader, and the artillery men and gunners will never have to turn their backs on the enemy. The recoil will be scarcely sensible, because the centre of gravity, the homogeneous centre of the mass, and the centre of resistance, will all coincide in one point, in addition to the immense mass of metal, here usefully employed, situated behind the bottom of the chamber in the act of firing, the only preventive of excessive recoil.



Some leverage and appliances will be required for elevation and depression, because the barrels will not be equally balanced by the charges. The friction, from the great weight upon the steel rollers, or upon whatever turntable be adopted, may be relieved by hydraulic pressure upwards upon the centre pin. The revolution of the twin gun takes place at about

8ft. above the platform, and therefore well clears the heads of the artillery men. It will occupy no more space on the platform than usual with guns of this calibre.—I am, Sir, yours, &c.,
HENRY W. REVELEY, C.E.

1, Baker-street, Reading, March 8.

#### DETERIORATION OF SUBMARINE CABLES.

SIR,—Your remarks upon my pamphlet on telegraph companies, in your paper of the 12th inst., are, I consider, extremely fair, and calculated to advance telegraphy; but I should like to make a few observations upon some portions of your article.

You say that the money spent on renewing land lines keeps the property always at its full value, but liues keeps the property always at its full value, but you do not prove that repairing a submarine cable does not do the same. You state that a submarine cable is gradually and surely depreciating. Now, this is mere theory; for some, if not all, of the cables laid by the originator of submarine cables (the famous Mr. Brett), and the first of which was laid in 1851, are still in existence, and, whenever picked up, are found to be in a most perfect state of preservation; besides which, the manufacture of submarine cables has been very greatly improved since the days of Mr. Brett.

You object to my characterising the Persian Gulf route to India as "almost useless," because communication has been well and satisfactorily carried munication has been well and satisfactorily carried on by means of this route for several years. I think, on referring to different reports that have appeared on the subject, you will find that a message, on an average, does not go very much quicker than if sent by post, and certainly those reports prove that a submarine line is at least worthy of a trial.

You say, "But, unfortunately, the author quite forgets that the arguments he appears to think so strong against the line from Bombay to Suez are stronger against the proposed scheme." This remark seems to me rather vague; might I ask you to explain your meaning more fully?

remark seems to me rather vague; might I ask you to explain your meaning more fully?
Lastly, allow me to say I am very sorry if I appear to have been "running down" different schemes. My only object in mentioning companies that I did not consider good investments was to put them in contradistinction to companies which I do think worth investing in, and so making my pamphlet really useful to investors.

Hoping you will find space for these remarks,—I am. Sir. yours. &c..

am, Sir, yours, &c.,

J. WAGSTAPF BLUNDELL

J. WAGSTAFF BLUNDELL.

49, Chancery-lane, London, March 16.
[The remarks we made relative to the gradual depreciation of submarine cables, so far from being "mere theory," were founded on facts known to any one with the least protension to acquaintance with submarine cables. We will simply take the special cable mentioned by Mr. Blundell, as an example, although many others could also be taken—the Dover and Calais cable, laid in 1851. Up to the present time this cable has been repaired about thirty or forty times, and in consequence of the present time this cable has been repaired about thirty or forty times, and in consequence of the breakages and numerous repairs necessary owing to the deteriorated condition of the cable, renewals to such an extent have been necessary that there is now only a little more than one half of the original cable down. We recommend Mr. Blundell (as he probably cannot see the cable himself), to refer to the Government Report on Submarine Cables, 1861. He will there find a very faithful and exact illustration of a specimen of the above cable. Cables, 1861. He will there find a very faithful and exact illustration of a specimen of the above cable, as it was ten years ago; his opinion on the perfect state of preservation of cables may probably undergo a change. We objected, and still do so, to Mr. Bluudell's sweeping assertion of the "almost useless" condition of the Persian Gulf line. If such had been the case, no business would have passed over it. The returns gradually show an increasing business.—ED. M. M.]

#### PERPETUAL MOTION.

SIR,—I shall be extremely obliged if you can inform me if it is correct that Government has offered a reward for the discovery of perpetual motion, what conditions are specified (if any), and what the amount of the reward is.—I am, Sir, yours, &c.,

J. EMERSON RUSSELL.

J. EMERSON RUSSELL.

11, Vincent-terrace, Islington, N., March 15.

[We are not aware that Government has done anything so foolish as to trouble itself about a question which is practically valueless; and we are astonished that there are still people to be found who can think twice upon the subject.—ED. M. M.]

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscriber of £1 is. 8d. yearly, or 10s. 10d. half-yearly, payable in

advance.
All literary communications should be addressed to the Editor of the MECHANICS MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS MAGASINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday avaning.

writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.
Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 64, per line, or 54, per line for 13 insertions, or 44, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

RECEIVED.—E. H. N.—P. B.—R. S.—T. H. J.—A. and I. C.—W. H.—G. E. P.—T. W.—R. M.—G. B.—H. D. T.—B. F.—S. R.—W. M.—E. B. M.—S. B. F.—J. E. R.—A. R. J.—P. O.—D. E.—H. H.—J. W. B.—J. A.—G. W. H.—S. E. —A. H.—E. B.—F. W. R.—J. T.—F. P.—T. B. D.—J. M.—T. R.—S. O.—J. B. and Co.—F. and L.—R. T. N.—S. W. and Co.—F. W. K.—J. E. O.—A. R.—J. B.

#### Micelinas for the Wicek.

MON.—Royal United Service Institution.—Sir Alexander Malet, K.C.B., on "Our Reserve Forces." If time will allow, a second paper will be read by Dr. Eddy, on "A Steel Moveable Mantelet for the Protection of Troops," at 8.30 p.m.
Royal Geographical Society.—"The Swedish North Polar Expedition of 1867, and other Arctic Projects;" and "Nimppo to Hangchow," by Mr. Christopher T. Gardner, at 8.39 p.m.
TUES.—The Institution of Civil Engineers.—Renewed Discussion on "American Locomotives and Rolling Stock," at 8 p.m.
WED.—Civil and Mechanical Engineers' Society.—Mr. Henry J. Rogers on "The Capture of Whales and other Fish by the Application of Electricity," at 8 p.m.

### Habal, Military, and Gunnery Items.

Mr. J. S. MACKIE will deliver a lecture on the Shoeburyness experiments in 1868, at the Royal United Service Institution this afternoon.

AT a special court held on Tuesday, at the Trinity House, Tower-hill, his Royal Highness the Prince of Wales was unanimously elected an elder Brother of the Corporation, in the vacancy occasioned by the death of Admiral Robert Gordon.

WE regret to have to announce the death, on Tuesday night, of Major-General John William Ormsby, R.A., the lieutenant governor and commandant of the Royal Military Academy at Woolwich. He was seized with a paralytic stroke on Tuesday afternoon, and died during the night.

THE death is announced of Admiral Sir Peter Richards, K.C.B, formerly one of the Lords of the Admiralty. The deceased was on the reserved half-pay list. He was made captain September 17, 1828; rear admiral, June 6, 1855; vice admiral, on April 12, 1862; and admiral, on September 12, 1865.

The Trinity Board has resolved to supersede the Longships lighthouse off the Land's End by a new structure on an adjoining rock. The contract for the granite work has been taken by a French firm, and all the granite for the work will be imported from France. The picking out of the foundation will commence at once. will commence at once.

THE British Consul at Charleston, Mr. Walker, warns shipmasters that the charts of that port published by the Admiralty, corrected to March last, are very inaccurate. The errors have been pointed out for correction, and masters trading to Charleston should supply themselves with Admiralty charts of a date subsequent to "III. 68."

At the last weekly meeting of the Mersey Docks and Harbour Board, a report from Admiral Evans, the Conservator of the Mersey, was read, from which it appearedthat in 1868 there was a decrease of 3,114 in the number of vessels entering and leaving the port, compared with 1867, but the tonnage showed an increase of 20,571 tons.

THE first steam boat, the propeller "John L. Hasbrouck," forced her way through to Poughkeepsie, on the Hudson, on the 25th ult. She broke through 6in. of solid ice for a distance of nine miles. While she was working in the middle of the river, just south of Poughkeepsie, crowds of persons ran ahead and by the side of her on the ice.

A suspension of the manufacture of the Palliser A SUSPENSION of the manufacture of the Palliser chilled shot has been ordered in consequence of a report made from Shoeburyness of the breaking of several of them in the bore of the gun when fired. It appears that the stud or bouche at the sides near the bottom of the shot are forced in by the explosive power of the powder, which breaks and destroys the missile, and until this defect can be remedied no more will be made.

THE committee which was appointed by the States of the Island of Jersey in September, 1866, to examine the various plans and estimates submitted to examine the various plans and estimates submitted for improvements and additions to the existing harbour of St. Helier, have arrived at the end of their duties, and have awarded the first premium of £300 to Mr. John Coode, C.E., while the second and third premiums of £200 and £100 have been assigned to Mr. A. Giffard, C.E., and Mr. W. R. Kinipple, C.E., respectively. About 40 different designs were sent in.

dipping old Armstrong shell cases into a cauldren of boiling lead, for the purpose of melting off the lead in which the shells are encased. A shell tead in which the shells are encased. A shell which had been charged was so treated, when an explosion took place, scattering the boiling lead over the three men employed, inflicting deep and agonising injuries. One of the sufferers had lost an eye by an accident some years ago, and now has lost the other. Their lives are in jeopardy.

The first stone of the new works for the extension of Portsmouth dockyard was laid yesterday week. A block of Portland stone, weighing some five tons, was fixed at one end of a vast excavation, which will form one of four docks that will stand on the south side of the new repairing basin included in the general plan of the extension works. A silver trowel, together with a square, plumb-line, &c., were handed to Mrs. Wellesley, who performed the duties of master mason, and declared the stone well and truly laid. A few words were then spoken by Rear-Admiral Wellesley, and a great engineering work was formally commenced. Tup first stone of the new works for the extension work was formally commenced.

The death of Admiral Sir Charles Christopher Parker, is announced as having taken place on the 13th inst. The gallant admiral was the third son of Vice Admiral Christopher Parker, who was eldest son of Sir Peter Parker, first baronet. He was born in 1792, entered the Royal navy at an early age, served in the Mediterraneau, at the capture of the Island of Capri, at the defence of Gaeta, and in an attack on a convoy off Cape Talliat. He was lieutenant of the "Malta" at the siege of Tarragona, and has been an admiral on the reserve list since 1863. The first baronet was for upwards of 80 years in the navy, and greatly distinguished himself in the American war; the second baronet was a captain in the navy, and was mortally wounded at the storming of the American camp at Bellaire, near Baltimore; the third baronet was a commander, the fourth was a captain, and the deceased baronet was an admiral. The baronetcy was created in 1782, so that within 90 years no less than five baronets have served their country in the naval service. THE death of Admiral Sir Charles Christopher

A WRITER in "Harper's Magazine" for the present month attempts a calculation of the number of lives lost on the United States coast and in American lives lost on the United States coast and in American vessels by shipwrecks, but there do not appear to be means of testing such a calculation. He estimates the loss at about 30 persons per week, or about 1.500 a year. More trustworthy is the following list of wrecks of American vessls in the last ten years, and the value of the property lost. In 1858 the number was 355, and the value of the property lost 8,897.665dols.; in 1869 (9 months) 300, and 42,897.665dols.; in 1869 (11 months) 405, and 12,011,030dols.; in 1861, 558, and 17,367,100, dols.; in 1862, 452, and 12,765,060,dols.; in 1863, 452, and 20,531,800dols.; in 1864, 495, and 20,449,850dols.; in 1865, 502, and 33,794,300dols.; in 1866, 471, and 31,056,100dols.; in 1867, 536, and 21,742,200dols.; in 1868, (9 months), 257, and 11,698,500dols. The total for 10 years and 5 months is 4,883 vessels wrecked, and the property lost, 198,702,876. This gives an and the property lost, 198,702.876. This gives an average daily loss nearly equal to one-and-half vessel, and in value 54,000dols.

#### Miscellanea.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending March 13, was 3,868. Total number since the opening of the Museum, free daily (May 12, 1858), 1.519.504.

At the ordinary meeting of the Society of Engineers, held on the 15th inst., Mr. F. W. Bryant, President, in the chair, a paper was read on "Joints for the Prevention of Leakage in Gas and Water Mains," by Mr. C. M. Barker.

WE have to record the death of Sir John Peter boileau, at Tor quay, on Tuesday week. He was born on the 2nd of September, 1794. Sir John had been a Fellow of the Royal Society since 1843, and was vice-president of the Society of Antiquaries.

WE understand that Her Majesty has signalised We undersumd that Her Majesty has signalised her accession to the list of Royal and noble authors by becoming patroness of the Booksellers' Provident Institution, and has testified her sympathy with its objects by a substantial donation to its funds.

THE French Academy of Sciences, at its last meeting, elected Dr. David Livingstone a corresponding member of that body in the section of geography and navigation, in place of the late Mr. Dallas Bache, of Washington.

The shock of an earthquake was felt on Monday evening throughout East Lancashire and West Yorkshire. The tremor was perceptible as far Yorkshire. The tremor was perceptible as far south as Manchester, and the Scotch papers record similar phenomena in the Highlands.

At a recent meeting of the curators of the Univerity of Edinburgh, a letter was read from Professor Lyon Playfair, M.P., intimating his intention to resign the chair of chemistry at the close of the present session. There are already a Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the Woolwich Arsenal. Three men were employed in number of candidates for the professorship.



THE council of the Royal Cornwall Agricultural Society have decided to hold the exhibition in 1870 at Launceston. This year's meeting will be at Penzance, and there is already promise of an exceedingly good one. The prizes offered exceed by £100 the amount in any previous year.

by £100 the amount in any previous year.

For the first time in its history, the House of Representatives, on February 27, listened to a speech from a negro. This negro, John W. Menard, claimed a seat from Louisiana, and spoke over an hour in advocacy of the claim. The House refused to admit him to membership, but voted him 1,500 dollars to pay his expenses at the capital, where he has been sell the winter. all the winter.

THE first spring show of the Royal Horticultural Society of the present year was held in the gardens on Saturday last. Such a collection of hyacinths, cyclamens, roses, and other spring flowers has never before been seen at South Kensington. The Dutch growers gave supplemental prizes amounting to £45, which caused a very keen competition among the various exhibitors. There was a very large and fashionable attendance.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending March 13, 1869, was—on Monday, Tuesday, and Saturday (free) from 10 a.m. to 10 p.m., 13,655; Meyrick and other galleries, 2,438; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 5 p.m., 1,954; Meyrick and other galleries, 217; total, 18,264. Average of corresponding week in former years, 10,500. Total from opening of Museum, 8,229,124.

10,000. Total from opening of Museum, 8,229,124.

The area of London, as defined by the Registrar General, and including extensive suburbs, is about 78,000 acres, or nearly 122 square miles. On this area stand over 400,000 inhabited houses, with an average of nearly eight persons to a house, giving a mean density of 40 persons to an acre. The estimated population at the present time is 3,126,635.

The county rate assessment of 1866 placed the annual value of property in London at £15,261,999.

An explosion took place on Monday morning at An explosion took place on Monday morning at Messrs. Kynveh's cartridge and percussion cap manufactory, Aston, near Birmingham. Girls were employed in one of the processes connected with the charging of the cartridges. These cartridges were drying upon a hot slab, and one of the girls were brushing them off quickly with her hand, when the friction with the slab caused the explosion. Five girls were much burned in the face, and are now in the hospital.

now in the hospital.

An important question, opened some years ago between the Asiatic Society of Bengal and the Government of India, has at last been brought to a satisfactory conclusion. It is now agreed that the society shall hand over to trustees, appointed by the Legislative Council, their collections of natural history, antiquities, miscellaneous objects, and the additions that may be made thereto. The Government on their part undertake to erect a suitable building, to maintain a proper staff of keepers, and to provide for all the charges of such a museum. a museum.

The oldest tree on recordin Europe is asserted to be the Cypress of Somma, in Lombardy, Italy. This tree is believed to have been in existence at the time of Julia Cæsar, 42 years before Christ, and is therefore 1,911 years old. It is 106ft. in height, and 20ft. in circumference at 1ft. from the ground. Napoleon, when laying down his plan for the great road over the Simplon, diverged from a straight line to avoid injuring this tree. Superior antiquity is claimed for the immense tree in Calaveras County, California. This is supposed from the number of concentric circles in the trunk to be 2,565 years old.

An extraordinary case of trance is reported from THE oldest tree on record in Europe is asserted to be

circles in the trunk to be 2,565 years old.

An extraordinary case of trance is reported from Burlington, Wisconsin. A little German girl had an attack of measles and diphtheria, from which she had nearly recovered on the 8th ult., when she fell into a state of coma, and has remained for 20 days without food and to all appearance lifeless. The heart seems to have ceased its pulsations, but blood flows from the veins if opened, the flesh is firm and fresh-looking, and a blister applied will act. Though the body has been enshrouded and placed in a coffin, its interment has been delayed to wait the results of further developments.

A short time ago. says the "Mining Journal."

the results of further developments.

A short time ago, says the "Mining Journal."
Pascoe Ellis, a young man working in the 180 fathom level east in Botallack mine about half a mile from the sea, after blasting a hole in a hard granite rock (not primary, but what is called the secondary granite), about 8in. off from a lode composed of quartz and iron, and 5ft. thick, discovered a substance, jutting up 3in. above the surface of the rock he had blasted. He took his hammer to break it off; but, on finding it flexible, with his chisel he cut it out. It proved to be a vegetable substance, about 4in. in length and 1jin. in diameter. It had the smell and appearance of the common orewed, found on our shores. What can geologists make of this fact?

A PORMEE manufacturer of whips in Birmingham oused of quartz and iron, and 5ft. thick, discovered a substance, jutting up 3in. above the surface of the rock he had blasted. He took his hammer to the rock he had blasted. He took his hammer to the the substance, about 4in. in length and 1lin. in diameter. It had the smell and appearance of the common oreth had the smell and appearance of the common oremake of this fact?

A FORMER manufacturer of whips in Birmingham has started a whip factory at a place called Footscray, in Victoria. He found a great local demand

for whips, and also that several of the raw materials for whips, and also that several of the raw materials which the manufacture required could be obtained at Footscray for an almost nominal cost. The adjacent abattoirs supply him with an abundance of sheeps' intestines, from which he makes his catgut. The rattan cane, which enters largely into the interior of a whip, comes as dunnage in rice and sugar ships from India. With these and similar advantages, in spite of the scarcity and cost of skilled labour, it is found possible to supply the colonial market with a more suitable article, and at a lower price than English manufacturers.

a lower price than English manufacturers.

To the various paper productions of this paper age—paper collars, paper shirts, and even paper waistcoats, bonnets, and hats—must now be added paper coffins. M. Szerelmey, the patentee of these coffins, seems to have a belief in the universal adaptability of paper to all the needs of civilized life. His object in introducing it in the manufacture of coffins is to obtain what so many people rather absurdly consider a desideratum—a perfectly airtight, water-proof, and damp defying shell, which nothing from without can penetrate, and nothing from within can escape. The Zopissa paper coffin, in which these conditions are said to be fulfilled, is a solid-looking structure, very much resembling in build and thickness the ancient mummy cases

# Patents for Inbentions. ABRIDGED SPECIFICATIONS OF

PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared excludents of the force of the force of the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FUNDACE.

BOILERS AND FURNACES—2658, 2659, 2663, 2688, 2705
BUILDINGS AND BUILDING MATERIALS—2655, 2660, 2684.

DUILBRS AND FURNACES—2698, 2699, 2663, 2688, 2705
BUILDINGS AND BUILDING MATERIALS—2655, 2660, 2684, 2685
CHEMISTRY AND PHOTOGRAPHY—2676, 2725, 2729
CULTIVATION OF THE SOIL, including agricultural implements and machines.—2652, 2706, 2711, 2720
ELECTRICAL APPARATUS—2665, 2684, 2707, 2711, 2720
FIBROUS FABRICS, including machinery for treating fibre pulp, paper, &c.—2649, 2650, 2653, 2656, 2664, 2675, 2678, 2679, 2686, 2690, 2698, 2704, 2710, 2723
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2670, 2696, 2719, 2724
paring food for men and animals—2670, 2696, 2719, 2724
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—2661, 2669, 2703, 2721, 2728,
GENERAL MACHINERY—2699
LIGHTING, HRATING, AND VENTILATING—2677, 2700
METALS, including apparatus for their manufacture—2704, 2713
MISCELLANEOUS—2662, 2668, 2673, 2674, 2680, 2689, 2693, 2694, 2695, 2701, 2708, 2714, 2715, 2717, 2722
ROADS AND VEHICLES, including railway plant and carriages, saddlety, and harness, &c.—2648, 2666, 2667, 2672, 2682, 2691, 2709, 2718
SHIPS AND BOATS, including their fittings—2671, 2727
STEAM ENGINES—2751, 2654, 2681, 2687, 2697, 2702
WARFARE—2657, 2692, 2712, 2716

2648 J. DAWSON, Thames Ditton. Shaft tug. Dated August 26, 1868.

This consists of a metal hooked support for the shaft. It is connected to the back band of the harness, and is It is connected to the back band of the harness, and is nade with a flat surface crossways for a strap to bear against: plates, checks, or guards are fitted, and these may have one or more bars or cross pins, extending from the check on one side to the cheek on the other, to prevent the strap falling out of the channel formed for it, by the flat surface of the hook and the cheek.—Patent abandoned.

2649 S. MORRIS Lancaster. Spinning makes Dated.

surface of the hook and the cheek.—Patent abandoned.

2649 S. Morris, Lancaster. Spinning mules. Dated
August 26, 1868.

The running band is taken over a grooved pulley, fixed
on a shaft, and worked from the present driving apparatus or otherwise. On the rim drum shaft, or other shaft
connected therewith, is a pulley to which a brake is applied;
this brake is connected to a weighted lever, the position of
which is governed by the counterfaller. When the countertaller is depressed by the yarn, the brake is applied,
thereby checking the velocity of the spindles, according to
the thickness of the cop.—Patent completed.

2650 I. Hamer. Bolton. Looms. Dated August 26, 1868.

he thickness of the cop.—Patent completed.

2650 J. Hamer. Bolton. Looms. Dated August 26, 1868. This consists in providing an extra shuttle box, picking motion, stick, and weft-stop motions; in subdividing the lathe and the reed of the loom, into two parts; and in the sadaptation of anexirs or intermediate shuttle box, centrally situated on the "fly board," between the two ordinary shuttle boxes, which is open at both ends, and provided with check straps to prevent the concussion and rebound of the shuttle.—Patent abandoned.

2652 R. W. MORGAN, Dublin. Reaping. Dated August 26,

68.
The Lord Chancellor has granted an extension of time r filing the specification of this patent.

2658 W. HOUGHTON, Leeds. Looms. Dated August 26

This relates to the "weft-fork motion," or the apparatus employed to stop the action of the loom, when the weft becomes either broken or used up, and consists in fitting the rod or bar upon which the fork is hinged, arranged to slide in a bracket or bearing fixed to the breast beam of he loom.—Patent abandoned.

2654 W. L. WILLIAMS, Liverpool. Motive power. Dated August 26, 1868.

A cylinder is formed with ports and fitted with a piston, piston rod, valves, and a fly wheel, the whole being carried or supported on strong framework.—Patent abandoned.

2655 E. ZOEPFEL, Manchester. Window frames. Dated

2655 E. ZOEPFEL, Manchester. Window Frances
August 26, 1868.
To the threshold of the doorway is fitted a clip, which
row the threshold of the doorway is fitted a clip, which
serves to retain in position a tubular strip of caoutchouc,
having a longitudinal recess or groove in the side nearest
to the door. To the lower edge of the door is affixed a
moulding or bar formed with a projecting wedge-shaped
odge, the sides of the wedge being preferably curved, the
moulding being so fitted to the door, that when the door is
closed, the projecting edge of the moulding will enter the
recess or groove in the caoutchouc.—Patent shandoned.

closed, the projecting edge of the mouding will enter the recess or groove in the caoutchout.—Patent abandoned.

2656 S. B. SAMUELS and J. Birks, Nottingham. Woven fabrics. Dated August 26, 1868.

For this purpose the warp threads of the fabric are arranged to pass from the warp beams through eyes in a series of warp bars, like those of a bobbin net machine. An number of widths of fabric are produced simultaneously in the machine, and each warp bar carries one warp in the machine, and each warp bar carries one warp thread of each width. The warp bars are actuated by means of cams or jacquard, as in a bobbin net machine, and by means of them the warp threads of each width are divided so as to form a shed. A shed being thus produced, a loop of the thread which is to form the weft of the fabric is carried through it by a weft carrier, and then, on the further side of the shed, a bobbin or shuttle having a thread in it, is thrown through the loop, and the thread retains and carrier returns. The bobbin or shuttle thread retains and holds the loop of the weft thread so that on the return of the weft carrier a double weft is left in the shod.—Patent completed.

2657 J. HANSON, Lincoln. Firearms. Dated August 26

2657 J.HANSON, Lincoln. Firearms. Dated August 26
1869.

The patentee constructs the striker with a projection at its hinder end, extending outwards from it and entering a slot formed in the inner side of the hammer. The slot is so shaped that when the hammer falls it acts on the projection of the striker and throws it forward. In central-fire breech-loading firearms a small pin is arranged to slide in a hole in the rib between the barrels. The to slide in a hole in the rib between the barrels. The rear end or head of this pin is caused by a spring to project, and enters an annular groove or recess formed at the end of the barrel to receive the cartridge flange. When there is a cartridge in the barrel, and the breech is closed, the flange of the cartridge displaces the pin, pushing it forward against the resistance of the spring, and in order forward against the resistance of the spring, and in order that this change in the position of the pin may indicate the presence of a cartridge, there is a hole passing from the exterior into the passage in which the pin works, so that a small portion of the stem of the pin is exposed.—

2658 A. Lupton, Chesterfield. Boilers. Dated August 26

2658 A. LUPTON, Chesterfield. Boilers. Dated August 26

2658 A. LUPTON, CRESTERIER. Batter August 26
1868.

This consists in forming a chamber or compartment behind the boiler in the flue in which two passages are formed between the boiler and the chimney, the one passage being closed by dampers when the other is open, and rice versa. The larger of these passages or thoroughfares is provided with firebrick abutments, against which fares is provided with firebrick abutments, against which the fiames and products of combustion escaping from the furnace implinge, thereby effecting a high state of temperature in such chamber; an inlet valve for fresh air is provided in the heated chamber, which is opened during the time the passage through each compartment is stoped by the damper; at this time, a thorougafare or passage is opened between the heated air chamber and the front of the furnace over the "dead plate."—Patent abandoned.

2659 T. Weigley, Lancaster. Furnaces. Dated

of the furnace over the "dead plate."—Patent shandoned.

2659 T. WRIGLEY, Lancaster. Furnaces. Dated August 27, 1868.

This consists in the employment of firebars or grates arranged in two or more distinct sets, each set being lower than the one in front; these sets of grates are supported on rollers secured to the sides of the furnace upon which they are capable of sliding: each set of bars project beyond or overlaps the next set, the last set being placed over a stationary grate near the bridge, thus giving a stepolic formation to the grid or entire grate of the furnace. like formation to the grid or entire grate of the furnace in the patent of them by tappets or eccentrics, and rods, indeparted to them by tappets or eccentrics, and rods, indeparted to them by tappets or eccentrics, and rods, indeparted to the set of bars have forward and backward motion imparted to the set of the furnace of the first set of bars, being the highest, project from the first set of bars, being the highest, project from the front of the boiler, under a hopper, which is constantly kept supplied with coat. When the furnace is in action, the sliding bars are successively pushed forward, from the highest set to the cases very pushed forward, from the highest set to the lowest, after which they are withdrawn; the intermittent econstantly to carry and rush forward the coal from the hopper towards the "bridge."—Patent completed.

hopper towards the "pringe. — Patent completed.

2660 W. M. JACKSON and R. GARRIES, Kingston-upon-Hull. Roofing. Dated August 27, 1868.

This consists in forming tiles of such a sectional shape that one edge shall overlap that of the tile on right side of it, while the other edge may be overlapped by that of the tile on the left side of it.—Patent completed.

2661 E. PEYTON, Birmingham. Bedsteads. Dated August 27, 1868.
This consists chiefly in curving the head and foot boards or rails, so that the legs can be brought more under the bedstead.—Patent completed.

bedatead.—Patent completed.

2662 L. P. Hebert, L. A. Moulin, J. P. and E. Couinck,
Paris. Inking press. Dated August 27, 1868.

This consists of an ink box of the same shape as the
tamp, with a vertical tube at the centre and top thereof;
stamp, with a vertical tube at the centre and top thereof;
the ink box is formed in two parts. The upper one contains the ink, and in the lower a sheet of cork, and a piece
of felt in contact therewith; the division plate of the
box and the piece of cork are pierced with small holes



for the passage of the ink on to the felt.-Patent aban-

doned.

2663 D. Smith, New Jersey, U.S.A. Smoke consuming. Dated August 27, 1868.

Two horizontal bars are made to rest upon the existing dead plates which support the ordinary furnace bars. These two bars extend the entire length of and deeper than the furnace bars. The horizontal bars support a number of crossbars. The horizontal bars support a number of crossbars, formed and arranged with apertures or spaces between or through them, for the admission of air. Inside these crossbars perforated screens are arranged. The screens aid in heating and more evenly distributing the air which passes through the apparatus, and also prevent any danger of displacing the bars in raking the fire or introducing fuel into the furnace.—Patent completed.

2664 B. BURROWS, Loicester. Separating silk. Dated August 28, 1868.

August 28, 1868.

The skein of silk to be divided into two or more smaller skeins is placed over a rotating roller, the axis of which is supported in a bearing, in a suitable frame or support at one end only, the other end being free to admit of the skein being passed over it. The motion of the roller can be arrested from time to time by means of a treadle, and its position can be adjusted to adapt it for receiving various lengths of skeins. The lower end of the skein is passed around a lever arm mounted on a centre, at a suitable distance below the roller. The lever arm and roller are parallel with each other, when the skein is stretched over them, by the depression of the lever arm (which is constantly drawn downwards to a certain extent by means of a spring). A further depression of the lever arm puts constantly drawn downwards to a certain extent by means of a spring). A further depression of the lever arm puts additional tension upon the skein when required. The skein of silk thus stretched over the rotating roller and lever arm is first operated upon by the flugers of the operator, so as to open and spread out the skein upon the roller; a beating action is then imparted to the lever arm during the rotation of the roller and skein, which effectually opens and separates the skein of silk evenly over the surface of the roller.—Patent completed.

2665 N. J. Holmes, Regent's Park. Telegraph. Dated August 28, 1868.

This consists in a combination of parts which together form the magneto communicator. This communicator This consists in a combination of parts which together form the magneto communicator. This communicator proper is simply a mechanical generator or producer of currents from the magnet, the necessary succession of which are regulated by the elevation and depression of a series of finger keys or buttons, corresponding to the several letters or signs on the dial, and under the control of the operator. The apparatus does not in any way form a part of the telegraphic circuit, either as interruptor of the current, or as a short circuit connector. Its action is purely mechanical, and the currents from the coils of the magnet pass at all times directly into the telegraphic circuit. All insulation of parts and delicacy of adjustment is thereby avoided.—Patent completed.

2668 J. Tulk Glascow. Treating sewage. Dated

2666 J. Tule, Glasgow. Treating sewage. Dated August 28, 1868.

The patentice employs compressed air for transferring the sewage from closed receptacles into closed tank carts. The carts are furnished with air pumps, driven by horse gear, for compressing or exhausting the air employed.—Patent abandoned.

2667 W. STRANG, Glasgow. Treating sewage. Dated gust 28, 1868.

2667 W. Striagu, Classon.

The patentee provides a vessel at the lower end of a discharge pipe, with separate outlets for the liquids and solids combined, and interposes therein a filtering or separating medium of sufficient depth, through which the liquids can pass, but which keeps back the solids.—Patent completed.

Van Maldetone. Cleaning glores. Dated

2668 G. KER, 'Maidstone. Cleaning glores. Dated August 28, 1865.
This consists in submitting gloves to the action of rotating brushes or scrubbers, supplied with a cleansing divist. fluid.—Patent completed.

2669 T. HENDERSON, Glasgow. Sewing machines. Dated

2669 T. HENDERSON, Glasgow. Sewing machines. Dated August 28, 1868.
This consists in placing the needle bar in a guide, which oscillates on a centre fixed to the frame of the machine. To the needle arm or lever a pawl is fixed, which, as the arm or lever makes its upward stroke, catches into a tooth of a ratchet wheel, which it revolves through a certain angle. In the face of the ratchet wheel pins are fixed that act upon the long arm or lever, the shorter arm of the lever acting against the guide which carries the needle bar, so that each time one of the pins in the ratchet wheel lifts the short lever, it again acts upon the guide, which it oscillates through a small angle; thus, the point of the needle is guided alternately to opposite points in the cloth. needle is guided alternately to opposite points in the cloth.

—Patent abandoned.

2670 B. CORCORAN and P. W. DUNHAM, Mark-lane. Mill-

2670 B. COROBAN and P. W. DUNHAM, Mark-lane. Mil-stones. Dated August 28, 1868.

This consists, first, in adjusting a vertical shaft and boss in the eye of the milistone to be dressed. The shaft and boss supports a horizontal radiating arm, so constructed that it can be regulated and adjusted in such manner that the diamond cutter shall work in a true plane.—Patent completed. completed.

2671 R. SAUNDERS, Croydon, Breakeater, Dated August 28

1883.

The patentee proposes to moor a pontoon or series of pontoons to seaward of the waters to be protected. Means of access to the structures are arranged. They contain series of longitudinal vertical bulkheads of different depths.—Patent completed.

2672 W. M'GREGOR, Notting Hill. Signal posts. Dated August 28, 1868.

The posts are made of telescopic sections to slide one into the other, so that all may be packed into the lowest and largest section to facilitate their transport from place to place.—Patent abandoned.

2673 C. H. GARDNER, Fetter-lane. Printing machines

2673 C. H. GARDNER, Fetter-lane. Printing machines. Dated August 28, 1868.
This consists of a bar or rod carrying arms or plates made adjustable at required distances apart. Two or more of these arms are provided at the ends with adjustable bitts, plates, or pieces. These are set or adjusted on the arms by serews and slots to regulate and register the margin of the sheet while being printed. The gripper bar carries a number of arms, teeth, or times formed with holes through which the first-named bar is passed.—Patent complated.

2674 E. RICHARDSON, Wapping. Bottle cases. Dated August 28, 1868.

This consists in making bottle cases from a substance equisiting of "spent" hops reduced to a pulp, into which glue and treacle, alum and bichromate of potass, are mixed. The compound is rolled into sheets or pressed in moulds to the required shape.—Patent completed.

2675 H. POTTER, Belfast. Bleaching. Dated August 29,

This consists in the employment of superheated steam for bowking, boiling, or bleaching cotton and other fabrics and fibres.—Patent abandoned.

2676 J. MARTIN, Manchester. Extracting pitch. Dated August 29, 1868.

August 29, 1803.
The patentee mixes with any suitable quantity of boiling water about eighty parts of ceal naphtha, four parts of lime, twelve parts of oil, with four parts of any kind of alkali. The wool is steeped in the mixture for about twelve hours, when the pitch will swim on the surface ready to be taken away for use.—Patent abandoned.

ready to be taken away for use.—Patent abandoned.

2677 W. E. Gedge, Strand. Compressing coal. Dated August 29, 1868.

The patentee describes his invention as follows:—It is based on the principle of pressure, by wedges applied in a rotary manner. It is composed of a framework, supporting the compression pieces, and the mechanism which sets them at work. These compressors are set on the circumference of two circular plates or tables. Each of these plates is provided with openings or cells, in which slide compression pistons are arranged so as to meet each other two and two, in order to grasp the material to be agglomerated or compressed.—Patent abandoned.

agglomerated or compressed.—Patent abandoned.

2678 J. and T. TATTERSALL and T. RICHMOND, Lancaster, Preparing cotton. Dated August 29, 1868.

This relates to apparatus for moving the roller, on which are cards to be ground to or from the periphery of the emery covered grinding roller, and to improved apparatus for regulating and adjusting the necks or bearings of card rollers, when such cards are being ground. At each end frame of the machine, and near the front thereof, a rack is employed, on which is a casting acting as supports to the card roller. These racks are worked by means of pinion wheels, placed on a shaft extending across the front of the machine, and on which shaft is a hand wheel for working the pinions and rucks, so as to cause the card roller to advance on or recede from the grinding roller. A brake is applied to the hand wheel, so as to prevent vibration.—Patent abandoned. Patent abandoned.

Patent abandoned,

2679 E. Jackson and J. Ogden, Oldham. Preparing cotton. Dated August 29, 1868.

This consists in the employment of a balance lever, upon one end of which is formed a trumpet mouth, through which the attenuated and combined slivers pass into the cans after leaving the drawing rollers; the opposite end of the balance lever is supplied with a sliding or adjustable balance weight, that, by its adjustment on such lever, nearer to or farther from its fulcrum, the greatest accuracy can be attained for different weights of cotton passing through.—Patent abandoned. through.-Patent abandoned.

2680 J. M. HUNTER, Strand. Aerial propulsion. Dated

August 29, 1868.
The Lord Chancellor has granted an extension of time for filing the specification of this patent.

2631 E. L. Parairra, Regent's-park. Steam engines.
Dated August 29, 1868.

The patentee introduces compressed airor other gaseous element within the working cylinders of steam engines, and avails himself of the heat of the steam when partially exhausted, to develope the expansive properties of the air or gas, and increase the propulsive force in the rear of the pistons.—Patent abandoned.

2682 W. NAYLOR, Mildmay Park. Raileay brakes
Dated August 29, 1868.
Weighted levers are suspended by a rope or chain passing under or along each carriage of a train, which weights
on being lifted or lowered act by the force of their gravity
through levers and connections upon the brake blocks, thereby forcing them against the periphery of the wheels. -Patent abandoned.

2633 C. F. VARLEY, Beckenham. Telegraphs. Dated August 29, 1868.

The insulated conductor and the strands of the ropes are twisted together in a slow spiral, instead of being placed inside the strands.—Patent completed.

2684 W. S. FLETCHER, Manchester. Door crerice guard

Dated August 31, 1868.

A strip of rubber or other elastic material is held in a clip fixed to the floor, directly under and pressed upon by the door when shut.—Patent completed.

2685 S. NEWTON, Oldham. Swing door hinge. Dated August \$1, 1868.

August 31, 1868.

This consists of a box having a square recess, with a stationary pin in the centre. A spiral spring is placed in this recess; a block rests on the spring, and has at the top a V-shaped groove with rounded tops. The bottom of the door is fitted with a shoe, having a part projecting from the door, of a V-shape, and a hole fitted on the stationary pin in the square recess to act as a bearing.—Patent abandoned.

GREENWOOD, Lancaster. Looms. Dated

August 31, 1868.

This consists in using short pieces of leather strapping so as to embrace and encircle the length of each shuttle box spindle.—Patent completed.

box spindle.—Patent completed.

2687 T. Lerter and W. Trueman, Stafford. Steam engines. Dated August 31, 1863.

This consists, first, in working the slide valves of steam engines. In place of the fixed studs against which the cams or tappets work, the patentees use movable surfaces in the form of anti-friction rollers. It consists, second, in connecting with the condenser two pumps worked by eccentrics on the main shaft of the engine. These pumps are so arranged that while one is making its advance stroke the other is making its are turn stroke. The waste steam and air thus drawn from the condenser pass by pipes connected with the pump cylinders into the atmosphere.—Patent completed.

2688 I. Regulators.

2688 J. FIELDHOUSE, Birmingham. Furnaces. Dated August 31, 1868.

The patentee uses, in addition to the ordinary firegrate in the front end of the internal flue of the boiler, a second firegrate, situated underneath the front end of the boiler;

second firegrate is placed in a chamber or fireplace the second firegrate is placed in a chamber or fireplace made for its reception. On the second firegrate a small fire only is maintained. The smoke and products of combustion from the fuel on the ordinary grate pass along the internal flue to the rear end of the boiler. They then pass back along external side flues to the front end of the boiler, and enter by nearly vertical flues the chamber or fireplace in which the second firegrate is placed. The small fire on the second firegrate, in addition to consuming or partly consuming the smoke from the fuel on the upper or ordinary grate, also heats the bottom of the boiler, and thereby effects such a circulation of the water as prevents the unequal heating of different parts of the boiler.—Patoni completed.

2689 H. WALKER, Warwick. Packing pins. Dated August 31, 1868.

This consists in printing the name and address of the maker upon the raised portions of needle and pin cases, as well as the numbers by which they are known.—Patent completed.

2690 J. WILKINSON, Leeds. Printing carpets. Dated August 31, 1868.

The fabric to be printed is carried forward in an uninter-

The fabric to be printed is carried forward in an uninter-rupted and continuous manner, under a series of printing cylinders or rollers, mounted in suitable bearings in fixed framings, in which are also mounted colour rollers, with the necessary appendages and accessories for the printing rollers, so that when set in motion, the printing operation may be carried on continuously, and without any inter-ruption and intermission, until any desired length of fabric has been printed.—Patent completed.

2691 W. R. LAKE, Chancery-lane. Coupling. Dated August 31, 1868.
This consists in the employment of cushions of india-rubber, in combination with a metal coupling of a ship's standing rigging.—Patent abandoned.

2692 W. R. LAKE, Chancery-lane, Firearms. Dated August 31, 1868.

August 31, 1868.

The rear end of the exterior surface of the projectile is grooved or channelled in such a manner as to form thereon spiral blades or shoulders. From each of these grooves a longitudinal passage or perforation extends to the forward part of the projectile. When the latter is expelled from the gun, air rushes through each of the passages, and, impinging upon the spiral blades or shoulders, gives to the projectile the desired axial rotation. Thus the riling or growing of the gun is rendered entirely unnecessary.—Patent abandoned.

2693 W. E. GEDGE, Strand. Turbine guard. Dated August 31, 1868.

This consists of a metal cylinder provided with blades.

set about 10in, apart, and covered with a grating or wire gauze. The cylinder is placed in front of the turbine, and turns on an axle, set at its two ends in two pieces of wood or metal.—Patent abandoned.

2694 N. THOMPSON, Now York. Culting nippers. Dated August 31, 1868.
The cutting edges of the nippers are forged from pieces of steel, which are dovetailed into the sustaining jaws. These cutting edges are as close as possible to the knuckle or hinge.—Patent abandoned.

or hinge.—Patent abandoned.

2635 L. T. A. P. RIVIERE, Cognac, France. Bottle cases.

Dated August 31, 1863.

The box or case is divided by partitions, having holes in them for the bottoms of the bottles to pass through; the holes in one partition are intermediate to the holes in the next partition; other partitions have holes also fitted in the case for the necks of the bottles.—Patent completed.

2696 J. C. Martin, Barnes. Gelatine. Dated September 1, 1868.

This consists in treating the cartilaginous matter of bone, after leaving the acid solution, in which the earthy matters have been dissolved out, with successive solutions of lime, or lime and caustic soda, weak at the commencement, and of gradually in prescript, are the solutions of the commencement, and of gradually in prescript. of gradually increasing strength, alternating with washings in water, causing a bleaching and softening of the material, rendering it soluble when submitted to heat of a compartively low temperature, and producing a white, strong, and tenacious jelly.—Patent completed.

2697 J. and W. BADGER, York. Steam engine. Dated September 1, 1868.
This consists in an arrangement of governors and ex-

This consists in an arrangement of governors and expansion gear, whereby the nacessity for the use of the ordinary throttle valve is obviated. On the end of a rod of the main shaft is a curved bar, connected at its upperend to a rocking lever, forked to embrace the shank of the governor stem; the governors are carried by horizontal bars, fixed to a crosshead; a valve rod is connected to the curved bar, and its opposite end carries a compound valve, which forms the exhaust and supply valve in one casting.—Patent abandoned.

2608 I Langey London Tripting good Dated September 1988.

2698 J. LADLEY, Leeds. Twisting wool. Dated Septem-

This consists in stopping each bobbin from rotating separately without stopping the machine.—Patent abandoned.

2699 F. HUDSON, Blackfriars-road. Liquid meters, Dated

This relates to an improved diaphragm, consisting of a central disc, surrounded by outer discs attached to leather, so that the diaphragm is allowed to work freely backwards and forwards. By this combination a perfect shape is maintained at each vibration, which perfects the registration of the meter.—Patent abandoned.

2700 W. C. HOLMES, Gracechurch-street. Gas. Dated

2700 W. C. Holmes, Gracechurch-street. Gas. Dated September 1, 1868.
This consists of a washer, scrubber, and condenser, and is formed into three distinct chambers, the lower one litted with trays and adapted as a washer, the upper and inner one, in which may be placed coke, breeze, or other suitable material, fitted with grids or not as a scrubber, while the outer chamber serves as a condenser. Attached to the top is a funnel or vasc-shaped vessel, supplied with water, which constantly trickles down the interior of the upper and inner chamber from a horizontal pipe, having a number of small holes therein, and connected with the vase before mentioned. The water, after percolating the coke, breeze, or other material, and falling to the bottom of this chamber, descends to the lower chamber or washer, where it is intercepted by shallow trays, over which the water falls in succession.—Patent completed.

2701 T. TOMS, Lambeth. Boots. Dated September 1,

2701 T. Tons, Lambeth. Boots. Dated September 1, 186

The boot is made with a front blocked or compressed



into shape, out of one piece of leather; the back part of the boots made out of another piece of leather also com-pressed into shape. The front and back are joined together at the bottom underneath the ancle; a waterproof gusset is secured in the space above the ancle by sewing.—Patent abandoned.

2702 T.G.F. DOLBY, Clapham. Vaires. Dated Sep.

tember 1, 1868. This consists in fitting metallic base plates to indiaruber valves, and forming an inclined or scarf in the rubber, so that one edge shall rest upon the other without passing through.—Patent completed.

2703 E. Jobson, Dundee. Pianofortes. Dated Septem.

ber 1, 1868.

The hammers or strikers of planofortes are covered with relvet or other piled fabric in lieu of leather.—Patent com-

velvet or other piled fabric in lieu of leather.—Patent completed.

2704 W. R. LAKE, Chancery-lane. Looms. Dated September 1, 1863.

This consists, first, in combining with long upright The levers have books or notches upon their opposite deges, which engage with the lifter and depresser mechanism. It also consists in so constructing and arranging harness jacks that they rest directly upon or against the harness jacks that they rest directly upon or against the harness jacks that they rest directly upon or against the harness jacks that they rest directly upon or against the hearin or cylinder, without the intervention of intermediate mechanism. Also in the employment of a yielding lifter mad arranged that it will yield to any undue strain or the pins of the cylinder, caused by their accidental projection too far from the peripheral surface of the cylinder; and lastly, in operating the warp of a fancy loom by means of hooks, one attached to each extremity of the connections from the barness, and seizing either hook by the movement of a bar or bars in other direction to raise and depress the harness, as may be determined by the contour of the pattern chain, and the retiring of the hooks to their normal condition by the return of the evener bar or bars.

Patent completed.

-ratent completed.

2705 W. W. MAOVAY, York. Glass furnaces. Dated September 1, 1868.

The glass furnace is formed after the manner of an The glass furnace is formed after the manner of an ordinary puddling furnace, with a fireplace at one end and a flue leading to the chimney at the other, and with workafue leading to the chimney at the other, and with workafue looked by stoppers while the melting is going on at the sides. This furnace is formed of a substance known as firestone, which may be obtained, among other places, from the Londonderry quarries, Yensher.—Patent and H. A. Bouward and the standard of the stan

2706 H. A. BONNEYILLE, Piccadilly. Regenerating grain.

2706 H. A. BONNEVILLE, Piccadilly. Regenerating grain.
Dated September 2, 1868.
The object of this is, first, to regenerate grain, seed,
betries, floor, fecula, dry vegetables, potatoes, and other
betries, floor, fecula, dry vegetables, potatoes, and other
such like alimentary substances, spoiled by fermentation
or excessive moisture, so as to render them once more it
for food. The substances are placed in apparatus, from
which the atmospheric air has been removed by means of
which the pumps. After submitting them to this treatpresent no difference with those
which have already been in a healthy state, and the flour
notably becomes again fit for conversion into bread.

Patent completed.

2707 J. H. GREENER, Adelphi. Insulating. Dated Sep-

tember 2, 1868.
This consists in the construction of insulators, composed of iron coated with an enamel of a non-conducting character; by preference, that manufactured in accordance racter; by preference to R. A. Brooman (No. 1646), 1863.

—Patent abandoned.

Patent abandoned.

2708 J. Adams and H. Bartlet, Jersey. Bottle stoppers.
Dated September 2, 1868.

The stopper is constructed of a cylinder or plug of hard wood, having a greater specific gravity than water, such as lignum vitee. This cylinder or plug is of a diameter as lignum vitee. This cylinder or plug is of a diameter as lignum vitee. This cylinder or plug is of a diameter slightly less than that of the opening of the neck of the bottle. And of a length exceeding the height of the neck of bottle. Near the lower end of the cylinder and around it is a groove, in which is fixed an india-rubber washer, and the cylinder, at a short distance above this groove, is hollowed out, to allow of space for the washer to be forced into, in order to pass through the neck of the bottle. To apply this stopper, the washer end is inserted in the neck of the bottle, by which the washer is flattened down, until it reaches the part of the bottle below its neck, when the washer expands and recovers its normal position. This stopper closes the bottle when it is filled by the pressure of the gaseous liquid from within, and the bottle is opened by applying pressure on the top of the stopper from without, by which it is forced down, and leavos the mouth of the bottle open.—Patent completed.

month of the bottle open.—Patent completed.

2709 E. CORTAZZI, New Cross. Suspending railways.
Disted September 2. 1868.

This consists of rails so constructed as to prevent vehicles getting off them, the whole being suspended from cables, or attached to suitable scaffolding, framework, or cables, or attached to suitable scaffolding, framework, or pillars, at a convenient distance above the surface of the ground. Two or more lines of rails may be arranged, side the suspended from separate cables, or attached to yold, suspended from separate cables, or attached to one and the same set of scaffolds or supporting frames, in which latter case the distance apart of the vertical in which latter case the distance apart of the vertical pillars or supports of the scaffolding or framing, and the length of the cross arches or bearers must be proportionately increased to allow room for the bodies of the vehicles to pass.—Patent completed.

2710 C. E. BROMAN, Fleet-street. Treating wool. (A communication). Dated September 2, 1868.

The process embraces the following consecutive operations:—First, cleansing or scouring of the raw wool by itons:—First, cleansing or scouring of the raw wool by itons:—First, cleansing or scouring of the raw wool by itons:—First, cleansing or soding and urine, and fuller's means of salts of soda, crystals of soda, urine, and fuller's carth. The bath would be composed of about 1,000 quarts of water, 50lb. of salt of water, 60 quarts of urine quarts of water, 50lb. of salt of water, 60 quarts of urine quarts of water, solb, of salt of water, 60 quarts of their search, and 25lb. to 35lb. of fuller's earth, 13-2deg. strength, and 25lb. to 35lb. of fuller's earth, Second, washing in water, to deprive the wool of the falt of immersion of the wool for about four hours in a bat. of immersion of the wool for about four hours in a bat. of water and sulphuric acid, the strength of the bath beinger when cold. Fourth, drying of the wool at a temperature of about 100 deg. to 125 deg. Fab. Fifth, beating of the wool to cause the desiroyed vegetable part to fall out. Sixth, immersion for from an hour to two hours

with agitation of the wool, in a bath of chalk.—Patent

abandoned.

2711 H. AITKEN, Stirling, North Britain. Treating grain-Dated September 2, 1868.

The patentee forms a core up the centre of the stack to within a few feet of the top. Air, gas, or steam is then forced into the core, until the straw or grain are brought to a dry and sound condition. When heated air, or gas, or hot steam, is used, it will be proper, towards the end of or hot steam, is introduce air of the ordinary temperature, or air cooled down with tee or otherwise, or by forcing air at a high degree of pressure, so as to expand into the stack, and so produce great cold.—Patent abandoned.

2712 J. F.C. CARLE Leadenhall street. Firegram. Dated.

stack, and so produce great cold.—Patent abandoned.

2712 J. F. C. Carle, Leadenhall-street. Firearms. Dated
September 2, 1868.

This consists in a peculiar construction of needle action
breed loaders. The chamber for the cartridge has a
breed loaders. The chamber for the cartridge has a
trumber of projections on it, at certain distances apart.
The sliding bolt has lugs or projection pieces, which take
into slots to hold it safe. The cartridge is composed of
double paper. Compressed paper wads are inserted into
the base, and an aperture is formed in the wad for the
ignition compound.—Patent completed.

2713 J. Evans. Stafford. Welding tubes. Dated Sen-

ignition compound.—Patent completed.

2713 J. Evans, Stafford. Welding tubes. Dated September 2, 1868.

This consists in employing a double set or two rows of dies, arranged opposite to and as counterparts of each other, in slide rests; they are capable of advancing and other in slide rests; they are capable of advancing and receding in a horizontal or vertical direction to or from the centre of the machine, so as to compress or close around, and securely weld the tube, which is drawn in a heated state from the fire through the sets, by welding or gripping tools.—Patent completed.

2714 J.J. Camprill. Reading. Wrappers. Dated September 2, 1865.

gripping tools.—Patent completed.

2714 J. J. CAMPELLI, Reading. Wrappers. Dated September 2, 1868.
This consists of a wrapper of jute, hemp, or other textile matter, made into two or more pieces, specially for securing bales of cotton, jute, and other fibrous material, either in a raw or manufactured state, and is intended to supersed the separate rope lashings or iron bands.—Patent completed.

completed.

2715 T. FORSTER and J. HEARTFIELD, Croydon. Indiarubber sponge. Dated September 2, 1868.
This consists in combining with india-rubber, guttaThis consists in combining with india-rubber, guttathe compounds, ground, animal, or
vegetable fibre together, with water, or other liquid or substance, which will generate vapour in the curing process,
or, in some cases, charcoal or other absorbent material
may be used in place of fibre.—Patent completed.

or, in some cases, charcoal or other absorbent material may be used in place of libro.—Patent completed.

2716 W. C. GREEN, South Molton-street. Firearms.

Dated September 3, 1868.

In the fixed part of the breech a striker is fitted to slide. In the fixed part of the breech a striker is fitted to slide. In the fixed part of the breech a striker is fitted to slide. In the fixed part of the breech a striker is fitted to slide freely to and fro in line with the axis of the barrel in a guide formed on the under side of the tail piece of the guide formed on the under mounted on a fulcrum in the trigger plate, the nose of which hammer projects up through a place, the nose of which hammer projects up through a precess or slot formed in the striker of the said hammer. A lever forming the trigger guard is mounted on a fulcrum in the trigger plate in front of the hammer. The upper in the trigger plate in front of the hammer. The upper on the lower end or trigger guard being lowered, comes into contact with the hammer and moves it back, together with the striker for cocking the gun. The barrel, which with a projecting catch on its under side, received in a with a projecting catch on its under side, received in a breech piece for locking the barrel. The rear end of this breech piece for locking the barrel. The rear end of this but is hook-shaped, and engages with a projection on the upper end of the lever or trigger guard before mentioned, so that on the trigger guard being lowered the bolt will be drawn back and the barrel unlocked for tilting simulation back and the barrel unlocked for tilting simulation with the cocking of the gun.—Patent completed.

2717 J. NEWMAN, Bedford-square. Puzzle fan. Dated

2717 J. NEWMAN, Bedford-square. Puzzle fan. Dated

2717 J. NEWMAN, Bedford-square. Puttle Jan. Dated September 3, 1868.

This relates to those which, when folded, are entirely enclosed in a tube, and are brought out or re-entered by pulling a cord on one side or the other. It consists in making the fan come out and unfold automatically and instantaneously by the aid of two helical springs placed within the tube or tubes.—Patent abandoned.

within the tube or tubes.—Patent abandoned.

2718 F. Preston and R. C. Ross, Manchester. Railway stop blocks. Dated September 3, 1863.

The patentees make use of a rocking block placed between the stop block. This rocking block fits into the between the trails, or the stop block may be arranged so, that, instead of rocking or revolving, it may be moved to alter its or the stop block may be brought in line with the rail or the stop block may be brought in line with the rails, as required. The block may be secured in the rails, as required. The block may be secured in the rails, as required, or the stop block may be moved to and froquired position by a pin or wedge; it is moved to and fround have and connecting rod, or otherwise, and by a hand lever and connecting rod, or otherwise, and by and down in the space between the ends of the rails by means of a lever or handle, or otherwise.—Patent completed.

C. KIRK, Glasgow. Storing ice. Dated Sep-

2719 A. C. Kirk, Glasgow. States 2719 A. C. Kirk, Glasgow. States 3, 1868.

This consists in compressing a number of separate pieces of ice together into a solid block by means of pieces of ice together into a solid block by means of pieces of ice together into a solid block by means of pieces of ice together into a solid block by means of pieces in the pieces of the pieces of

abandoned.

2720 J. GRIFFITHS, West Firle, Sussex. Uprooting trees.
Dated September 3, 1868.

The patentee proposes to secure a rope or chain to the tree or root to be uprooted. The rope is connected to tree or root to be uprooted. The rope is connected to double or single blocks, through which a tackle is rove, double or single blocks, through which a tackle is rove, secured at one end to an anchor (the stump of a tree for secured at one end to an anchor (the stump of a tree for secured at one end to an anchor (the stump of a tree for secured at one of the tree, acting as a sort of and the roller at the foot of the tree, acting as a sort of fulcrum, materially assists in uprooting it.—Patent completed.

pieted.

2721 A. M. CLARK, Chancery-lane. Camp bedstead. Dated September 3, 1868.

This consists in the combination of a travelling trunk. This consists in the combination of a travelling trunk. The same time to hold or box and bedstead, serving at the same time to hold or box and other articles, and also as a courh camp or travelling bed or litter for the transport of wounded or sick persons.—Patent completed.

2722 E. L. PARKER, Birmingham. Fastenings for braces.

2722 E. L. PARKER, Birmingham. Fastenings for braces. Dated September 3, 1863.

This consists essentially of two metallic plates hinged or jointed together. The under or back plate has two parallel slots in it, through which the end of the brace is passed. The upper or front plate has a series of teeth, when the plate is shut down upon the under or back plate, press the brace against the bar, between the slots or under the back plate, and hold it securely. Near the lower edge of the under or back plate is shut down, posses through a hole in the said upper or front plate is shut down, passes through a hole in the said upper or front plate of the tubes of the brace are secured to a ring or plate of the hook, or when the hole in it, and when the ring is hooked on the hook, or when the hole in the plate of metal is engaged with the head of the stud, the upper or front plate is securely held between them.—Patent completed.

securely held between them.—Patent completed.

2723 T. V. J. ATHERTON, Lancaster. Looms. Dated September 4, 1868.
This consists in an apparatus for holding the brake from the flywheel, when the loom is worked for a short time by hand, and for removing the brake when the loom is started. To the stopping and setting-on handle a short is started. To the stopping and setting-on handle a short is started, having at the pointed end a raisod projecting, and at the other end an inclined part projecting downwards, which part passes through a slot in the side frame of the loom; the long arm of the ordinary brake lever rests on the short arm.—Patent abandoned.

2724 T. GRAFTON. Birmingham. Slicing eucumbers.

lever resis on the short arm.—Patent abandoned.

2724 T. Grafton, Birmingham. Slicing cucumbers.
Dated September 4, 1868.

This consists of a fluted or corrugated hollow cylindrical case, open at both ends, in which case a travelling cal case, open at both ends, in which case a travelling late or holder works, by which the cucumber or other plate or holder works, by which the cucumber or other in one of the flutes of the case, passes through a screw hox on the plate or holder. By turning this screw, motion is given to the travelling plate on the ends of the screw. Outside the ends of the case are knives or cutters, by Guiside the ends of the case are knives or cutters, by giving a rotary motion to which (the cutters) the cucumber or other article fixed in the plate or holder described is advanced from the open end of the case at which the knife or cutter is situated, and cut or sliced by the said knife or cutter.—Patent completed.

2725 J. H. JOHNSON, Lincoln's Inn. Extracting colour.

knife or cutter.—Patent completed.

2725 J. H. Johnson, Lincoln's Inn. Extracting colour.

Dated September 4, 1868.

This consists in the employment of aniline or salts of This consists in the employment of aniline or salts of aniline in conjunction with an oxidizing agent, such as aniline in conjunction with an oxidizing agent, such as chlorate of potash, together with an acid such as hydrochlorate of potash, together with about 20 grammes of warm water, and made into a paste with about 2 pints of warm water, and made into a paste with about 2 pints of warm of potash, to this is added about 40 grammes of sulphate of iron, and about and about 4 grammes of sulphate of iron, and about 10 grammes of muriate of amnionia. To this mixture, when cold, there is to be added about 60 grammes of aniline or of a salt of aniline, and the mixture is then ready for use.—Patent abandoned.

2726 G. White, Cheapside. Precenting incrustations in

ready for use.—Patent abandoned.

2726 G. White. Cheapside. Precenting incrustations in boilers. Dated September 4, 1868.

This consists in the employment of a metal lining fixed over the entire length of a boiler, at a small distance apart, against the lower part of the inner surface. The upper portion of the lining extends at a small distance above the normal level of the water of the boiler. Small holes the normal level of the water of the lining, in each of which holes a corresponding short tube is inserted, whilst layer of fron turnings, pebbles, or other suitable heavy materials is provided in this part of the lining, and serves as a collector for the incrustating matters.—Patent abandoned.

2727 T. BUTTERWORTH, Oldham. Pumps. Dated Sep doned.

tember 4, 1868.

The pump consists of an ordinary barrel and plunger. The pump consists of an ordinary barrel and plunger, but, instead of the ordinary suction and delivery valves, a but, instead of the ordinary suction and delivery valves, a but, instead of the ordinary suction and delivery valves, a but, instead of the plung barrel and suction pine, munication between the pump barrel and suction pine, munication between the pump barrel and delivery pipe. The and between the pump barrel and delivery pipe, one to the pump barrel, is connected to the suction pipe, one to the pump barrel, and one to the delivery pipe, and a passage is cut in the and one to the delivery pipe, and a passage is cut in the pump barrel and the suction pipe and delivery pipe alternately.—Patent completed.

alternately.—Patent completed.

2728 D. Jones, Worcester. Umbrella stand. Dated September 4, 1868.
This consists in the construction of stands for helding This consists in the construction of stands for helding and supported by a tube, which may be of any shape. The tube ported by a tube, which may be of any shape. The tube is placed in an angular position for the purpose of throwing the article supported in a backward direction, so as to be less in the way. The tubes or supports are fitted into a body acting as a reservoir, with outlets for emptying the water, and this body may be of any shape, or it may be made water, and this body may be of any shape, or it may be made to fit or suit any recess or place it may be required to convey stray drops into the reservoir is fitted with perforations to convey stray drops into the reservoir. A rail is attached to the body to keep damp umbrellas or parasols from touching walls or articles placed in proximity thereto.—Patent completed.

2729 A. M. A. LAFORGUE, Paris. Surgical instrument.

2729 A. M. A. LAFORGUE, Paris. Surgical instrument.

Patent completed.

2729 A. M. A. LAFORGUE, Paris. Surgical instrument.
Dated September 4, 1868.

This consists of a haudle made hollow or solid, and having at its upper extremity, a bag made of goldbeater's skin, constructed with two valves, separated by a plane or diaphragm passing through the axis. The two valves are connected by a seam made with two flue wires or threads connected by a seam made with two flue wires or threads joining at the top; both valves are furnished with a strip joining at the top; both valves are furnished with a strip in the suitably fixed to their tops, the lower part of the bag being fixed to the handle; the extremities of the straps and of the wires are attached to another wire or cord passing into the interior of the handle, if it is hollow, or into exterior grooves if it is so id. The bag is filled with medically powder, through an exterior hole made in the handle, and to pass into the required cavity by means of the caused to pass into the required cavity by means of the handle. It is then only necessary to draw a ring or nob at the end of the wire, and the gram threads or wires will solid in the holes made for their passage, and the valves are set free. The straps from the top heing drawn by the wire or thread, will open the bag, folding hack exteriorly will on each side the membrane or other material of which the valves are made, leaving the powder at the part required.

Patent completed.



#### APPLICATIONS FOR LETTERS PATENT.

Dated March 9, 1869.

Dated March 9, 1869.

707 W. R. Lake, Southampton-buildings, Chancery-lane. Improved apparatus for converting a reciprocating motion into a rotary motion.

708 F. F. Villepigue, Northumberland-street, W.C., London. Improvements in the construction of velocities.

London. Improvements in the construction of velocipedes.

709 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in mechanism for operating tilt hammers, and in the mode of applying power to the same 710 R. Briggs, Leeds. Improved self-acting apparatus for regulating the internal temperature of rooms in buildings or in other structures which may be warmed or heated by means of steam, hot water, or hot air.

711 J. J. Shedlock, King's-road, Camden Town. Improvements in wet gas meters.

712 J. J. Shedlock, King's-road, Camden Town. Improvements in dry gas meters.

713 H. A. Bonneville, Sackville-street, Piccadilly. A new sort of porcelain, and a new and improved process for manufacturing the same.

714 H. Mason, Bradford, G. Hartley, Bright-street, Lister Hills, Horton, near Bradford, and J. Hindle, Otteyroad, Bradford. Improvements in looms for weaving.

715 I. Hudson, Stockport, Chester. Certain improvements in self-acting tilts for casks, barrels, or other receptacles.

ments in secretaring the receptacles.

716 J. Dickie, Glasgow. Improvements in arrangements for uniting the parts of grates, ranges, stoves, and other cast-iron articles or structures.

717 B. Hunt, Serie-street, Lincoln's Inn. Improve-

other cast-fron articles of structures.

717 B. Hunt, Serle-street, Lincoln's Inn. Improvements in road locomotives.

718 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in turbine wheels, and in apparatus connected with the same.

719 A. M. Clark, Chancery-lane. Improved fabrics or materials applicable as umbrella and parasol coverings, and for other purposes.

720 H. W. Goldring, Moorgate-street, City. Improved machinery or apparatus for the manufacture of soap.

721 G. Goldsmith, Leicester. Improvements in means and apparatus for communicating or signalling from one portion of a railway train to another, parts of which improvements are also applicable to other purposes.

722 G. H. T. Finzel, Bristol. Improvements in cooling and sifting ground animal charcoal after it has been reburned, and in apparatus employed for this purpose and for raising ground animal charcoal to any desired height.

height.

723 R. M. Caffall and D. Miller, Alton, Southampton, Improved means for rendering walls and other exposed surfaces impervious to the action of water or moisture, and to preserve them from atmospheric and other destroying influences or causes.

724 J. Henderson, Auchencairn, near Castle-Douglas, North Britain. Improvements in the manufacture of iron and steel, and in furnaces to be used in such manufacture.

and steel, and in lurinaces to be used in such manufacture.

725 J. Edwards, Richmond-road, Hackney. Improvements in the permanent way of railways and signalling on railway trains.

726 W. Saunders and C. Smith, Newgate-street, City. An improved combined dressing case and bag.

727 G. Spencer, Cannon-street, and J. Barker, St. Leonards, Mortlake, Surrey. Improvements in preserving animal substances, fruits, and other substances made from corn, grain, or other vegetable matter.

728 T. Obach, Manchester. Improvements in 'fuel economizers, parts of which are applicable to joining and fixing pipes for other purposes.

729 W. Walker, Newton Heath, near Manchester. Improvements in expansion slide valve gear for steam and other motive-power engines.

Dated March 10, 1869.

730 W. R. Lake, Southsmpton-buildings, Chancery-

730 W. R. Lake, Southampton-buildings, Chancery-ane. Improvements in devices for rendering gas burners

hate. Improvements in the 731 B. Britten. Red Hill, Surrey. Improvements in the

self lighting.

731 B. Britten. Red Hill, Surrey. Improvements in the construction of whips.

732 W. Weldon, Park Villa, West Hill, Highgate. Improvements in obtaining certain compounds of manganese from chlorine residues, and in manufacturing chlorine by means thereof, and in apparatus and arrangements for these purposes.

733 J. Sax, Great Russell-street, Bloomsbury. Improvements in the receiving instruments of A. B. C. telegraphs (magnetic) and bells.

734 W. Knowles, Round Hill Mill, Bolton. Improvements in mules for spinning and doubling.

735 R. Rule, Glasgow. Improvements in weaving ornamental fabrics.

736 C., W., and J. Drake, New Kent-road, Surrey. Improvements in machinery suitable for breaking stone to prepare it for the manufacture of concrete and for other purposes, also in machinery for mixing concrete.

737 F. O. Palmer, Webbs, near Hurstpierpoint, Sussex. Improvements in apparatus for conveying goods or passengers from one place to another.

738 G. Spencer, Cannon-street, City. Improvements in preserving corn and other grain, beans, and seeds, malt, biscuit, flour, and other substances made from the same, and animal and vegetable substances.

739 A. Moncrieff, Culfargie, Perthshire. Improvements in mounting and working ordnance on the Moncrieff system.

crieff system.
740 D. Johnson, Wrexham, Denbigh. Improvements in

machinery for decordicating and cleaning grain.

Dated March 11, 1869.

741 J. B. Bernier, Wilmington-square, Clerkenwell.

An improvement for the preservation of yeast for manurical man

An improvement for the preservation of yeast for manuring purposes.
742 T. H. Harrison, Liverpool. A self-acting backwash chamber for water-closets.
743 W. Wells, Ardwick, near Manchester. Improvements in apparatus for sanitary purposes.
744 G. Glover, Ranelagh-road, Pimilico. Imparting colours to hydro-carbonaceous fluids.
745 W. H. Clapp, Balls Pond, Islington. Improvements in signal lanterns.
746 J. and A. Waddington, and F. Bell, Barrowin-Furnoss. A new or improved method of, and apparatus or machinery for, condensing and utilizing steam or other vapours attising from the boiling of liquids, wort, and other ingredients in breweries, distilleries, and other places.

747 W. Betts, Wharf-road, City-road. Improvements in the manufacture of capsules.
748 C. H. Cooper, Birmingham. Certain improvements in whip sockets.
749 J. Bathgate, Edinburgh. Improvements in the construction of certain parts of gas meters.
750 W. E. Newton, Chancery-lane. Improvements in cases for holding cigars and other articles.
751 W. E. Newton, Chancery-lane. An improved attachment for adjusting cords for hanging pictures, mirrors, glasses, and for other analogous purposes.
752 T. Greenwood, Leeds. An improved method of, and apparatus for, preparing or slivering the short drafts of dressed silk waste or other fibrous materials.
753 J. H. Johnson, Lincoln's Inn-fields. Improvement in the preparation of artificial fuel, and in the manufacture of gas and coke therefrom.
754 H. Ormson, Chelsea. Improvements in boilers for hot water apparatus and steam generating purposes.
755 J. M. Napier, York-road, Lambeth. Improvements in machinery and apparatus for the manufacture of metallic moneys, coins, and modals, part of such improvements being applicable to other purposes.
756 G. Smith, Headingley, Yorkshire. Improvements in finishing woollen cloths and mixed fabrics.
757 F. R. Aikman, Brompton-crescent, Brompton. Improvements applicable to firearms and ordnance, for the purpose of facilitating instruction in firing with precision.
758 T. Beeley, Hyde Junction Iron Works, Chester, and D. Hanson, Dukinfield, Chester. Improvements in appa-

the purpose of facilitating instruction in ming with precision.

758 T. Beeley, Hyde Junction Iron Works, Chester, and
D. Hanson, Dukinfield, Chester. Improvements in apparatus for welding and flanging plates and tubes used in
the manufacture of boilers and other constructions.

759 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in machinery for spinning and
twisting fibrous materials.

Dated March 12, 1869.

760 W. Coxhead, Gresham-street, City. Improvements
in goloshes, shoes, or overshoes made of india-rubber.

761 E. F. R. Lucas, Middlesborough-on-Tees, Improvements in the manufacture of soluble phosphate of line,
and of phosphatic manures.

ments in the manufacture of soluble phosphate of lime, and of phosphatic manures.

762 H.J. B. Kendall, Great Winchester street, City. A new or improved preservative paint or composition for protecting ships' bottoms, preserving submarine woodwork, and other useful purposes.

763 J. Porteous, Edinburgh, and H. Gibson, Musselburgh, Midlothian. Improvements in the manufacture of tobacco, and in the machinery or apparatus employed therefor.

therefor.
764 D. S. Price, Great George-street, Westminster. An

764 D. S. Price, Great George-street, Westminster. An improved paving for roads and tramways.
765 E. Pritchard, Fenchurch-street, City. An improved safety button or stud adapted for articles of dress and other articles, the parts whereof require to be frequently connected together and detached.
766 G. Bray. Deptford, Kent. Improvements in connecting and disconnecting apparatus applicable to pole heads for carriages and vehicles and to other uses.
767 J. Cooke, Lincoln. Improvements in ploughs.
768 H. J. Cenant, Tubize, Belgium. Improvements in the construction of steam, water, and other cocks.
769 C. E. Brooman, Fleet-street, City, patent agent. Improvements in the process of, and apparatus for, the manufacture or recovery of salt from salt water or brine.
(A communication.)

(A communication.)
770 L. Labadie, Bordeaux, France. An improved magnetic regulator applicable to the compasses of iron ships.

ships. 771 J. Duffey, Chelsea. Improvements in railway brake

and coupling apparatus.

772 A. M. Clark, Chancery-lane. The application and treatment of a new material for the preparation of pulp for paper.

pulp for paper.

Dated March 13, 1869.

773 H. C. Bartlett, Garlick-hill, City, and A. G. Southby, Bulford, Wilts. Improvements in paper-making.

774 W. H. Harfield, Royal Exchange-buildings, City. Improvements in capstans and capstan windlasses, chain controllers and stoppers, and in chain shackles.

775 J. B. Palmer, Palace Works, Old Ford-road, Bow. Improvements in the manufacture of matches and fusees, and of surfaces to be used for igniting matches and fusees.

776 H. Delattre, Roubaix, France. A new kind of

tissue.
777 P. B. O'Neill, Rue du Faubourg St. Honore, Paris, and W. H. H. M'Neight, Dublin. Improvements in apparatus or machinery for raising, lowering, and suspending venetian or other blinds and shutters.
778 E. W. and M. Slade, Wilton, near Salisbury. An improved portable oven or cooking apparatus.
779 J. Thomas, Birmingham. Improvements in repeating frearms.

779 J. Thomas, Birmingham. Improvements in repeating firearms.
780 C. Vero, Atherstone, Warwickshire. Improvements in machinery for hardening and felting the bodies of hats and other coverings for the head.
781 J. Thomlinson, Abbey-street, Carlisle, and W. Thomlinson. Loughborough, Leicestershire. Improvements in the manufacture of paper and textile fabrics, and in the preparation of gypsum to be used in such and other manufactures.
782 W. T. Carpenter, West Minster, Isle of Sheppy, Kent. Improvements in apparatus used in the manufacture of gas.
783 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in breech-loading firearms.
784 J. Tenwick, Grantham, Lincolnshire. Improvements in the construction of annealing ovens and kilns.

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2821 C. E. Fommier
2822 M. A. Soul
2823 J. D. Pinfold
2825 H. J. Turnball
2834 C. de Bergue
2836 J. H. Schucht
2844 W. Durham
2853 J. de Masy
2855 G. B. Sharpe
2860 T. Beards
2862 W. T. Watts
2865 T. and J. Jones, J.
Brandwood, and J.
Wren

207 F. B. Ensor

#### Sealed March 16, 1869.

ch 16, 1869.

2950 R. Oxland and J. Hocking
2974 T. Briggs
3030 J. Baker
3058 J. H. Johnson
3064 J. Watson
3064 J. Watson
3098 H. Deacon
3171 W. E. Newton
3246 C. B. James
4 3884 M. B. Westhead and
C. B. James
4 3885 J. Sturrock
3515 C. D. Abel
3560 W. E. Newton
3760 W.Gray and T.Biggin
114 A. V. Newton 2652 R. W. Morgan 2882 J. Smith and J. Dewdney 2883 W. H. Hughan 2887 J. Blakey 2889 W. Havnes 2899 W. C. Woodcock 2899 W. C. Woodcock 2905 J. Kirk and J. Bat-5006 J. G. Piton 2006 J. G. Piton 2017 C. Vero 2912 W. J. Murphy and J. B. O'Hea 2915 W. Leatham 2928 W. Thomas 2939 W. T. Watts and D. J. Fleetwood

# NOTICES OF INTENTION TO PROCEED WITH PATENTS.

#### From the "London Gazette," March 16, 1869.

From the "London Ga
3342 B. Johnson
3343 G. F. Morant
3349 E. T. Hughes
3350 I., W., and J. Holt,
and J. Maude
3355 H. Jewitt
3367 R. Cook
3360 J. Clark
3361 J. Clark
3369 T. and T. P. Lucas
3389 T. and T. P. Lucas
3389 I. and T. P. Lucas
3389 I. and T. P. Lucas
3381 J. C. Haddan
3389 I. Lewthwaite
3392 W. Corden
3394 N. Wilson
3394 N. Wilson
3400 P. E. de Wissocq
3417 W. Riddle
4417 W. Riddle
4418 T. R. Crampton
4420 T. Vaughan and E.
Watteeu
3441 W. Donisthorpe
3442 G. P. White
3450 J. Stephens
3456 A. J. Deblon
3457 C. Jones
3458 W. N. Nicholson
3470 J. C. M. Donald and
J. Calverley
3471 H. Aitken 3482 E. Hogg 3488 J. Jones and S. P. Bidder 3488 J. Jones and S. P. Bidder
3499 C. Richardson
3517 W. Avery and A. Fenton
3527 A. Leykauf
3539 C. D. Abel
3542 J. Sims
3567 J. H. Johnson
3602 A. M. Clark
3699 H. W. Fuller and I. W. Barnum
3673 A. M. Clark
3699 H. W. Fuller and I. W. Barnum
3673 A. M. Clark
369 J. Howard
486 F. H. Collins
545 G. A. Fall
546 T. S. Blair
559 J. Breeden
591 W. T. Eley
599 J. T. H. Richardson
638 J. Woods, J. Hampson, and L. and G. Fish
641 F. A. Gatty
713 H. A. Bonneville 8471 H. Aitken

# PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

HAS I
641 J. Tansley
704 S. F. Schoonmaker
732 G. Phillips
744 T. A. Mathieson
758 L. Kaberry
759 J. Etler
763 J. F. Belleville
769 G. M'Kenzie
782 T. Briggs
788 A. Pilling

I PAID.

789 J. H. Johnson

798 J. Heaton

824 T. N. Kirkham, V.
F. Ensom, and H.
Brook

825 P. G. R. Westmacott

843 S. Chatwood and J.
and T. Sturgeon

865 T. Ironmonger

880 W. T. Eley

## PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

HAS B 647 J. B. G. M. F. Piret 648 J. T. Calow 671 W. Conyers 737 W. Barber

739 J. M. Courtauld 824 T. Guibal 810 T. White

#### PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the following numbers:—

3867	579	596	605	616	628	641	650
8925	581	597	606	617	629	612	651
352	583	598	608	618	630	643	654
357	585	599	609	619	632	644	656
447	587	600	610	620	633	645	658
499	589	601	612	621	636	646	660
510	591	602	613	622	637	647	662
521	593	603	614	624	638	648	664
543	595	604	615	626	640	649	666
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#### OF SPECIFICATIONS PUBLISHED LIST For the week ending March 13, 1869.

No.	ı	٠ <u>.</u>	No.	1	r.	No	1	Pr.	No.	ı	Pr.	No.	P	r.	No.	F	7.
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2263	2	0	239:			242			2436			2447	0	4	2462	0	4
2327	0	6	239	1	6	242	30	4	2437	0	4	2449	0	10	2466	0	10
2328	2	10	2396	1	4	242	50	4	2438	0	10	2450	1	4	2468	0	4
2343	1	0	2398	3 1	0	242	70	10	2440	0	8	2451	0	4	2470	0	4
2357	1	0	2400	0 0	8	242	91	2	2441	0	4	2452	0	4	2475	0	4
2366	13	6	2401	ı	4	243	00	10	2442	0	4	2453	0	4	2477	1	4
2377	1	2	240:	2 1	6	243	40	6	2444	1	6	2454	0	4	2479	0	4
2386	1		240			243	50	4	2445	0	4	2459	0	4	2489	0	4
2387	10	- 8	2409	910	10	•	- 1			ı			1				

NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office MoneyOrder should be sent, payable to ROBERSON, BROOMAN, and CO., Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

THE

#### MAGAZINE. MECHANICS'

LONDON: THURSDAY, MARCH 25, 1869.

# TEMPORARY STRUCTURES.

"OH, it is only temporary." This is the ordinary answer given to anyone who ordinary answer given to anyone who hazards a remark respecting the safety of a scaffolding, dam, bridge, or other work of construction doing duty until its permanent successor is erected. In many instances, it would appear that anything that will just hold together is considered adequate for hold together is considered adequate temporary purposes; and the limbs and lives temporary purposes; and the limbs and lives of those who have to trust to them for support are jeopardized with the most reckless indifference. It was but yesterday, that a temporary bridge, nearly 60ft. above the road beneath, fell in, burying everything and everybody in its fall, and involving a serious loss of life. Sometimes the public suffer from the insecurity and the unsoundness suffer from the insecurity and the unsoundness of work of this nature, but more frequently the workmen. At the same time, it is not to be imagined that every accident that may happen to a workman is due to causes of a constructive character. Frequently, they themselves, and themselves only, are to blame for what befals them. Impunity from danger begets rashness, and the manner in which some of them will hazard their personal safety is deserving of the strictest condemnation. Not only does it betray on their part a total disregard for their own lives, but by the irresistible influence of bedayample. but, by the irresistible influence of bad example, it induces others who are neither so skilful nor it induces others who are neither so skillul nor gifted with the same nerve, to imperil themselves in a similar manner, frequently to their own destruction. This self jeopardizing of human life on the part of workmen should be strictly forbidden by those in charge of works, under pain of instant dismissal. Independently of the humane view of the question, it is a stroke of policy besides. of the question, it is a stroke of policy besides, since masters and employers have often to make compensation for accidents of this nature, which result solely from the rashness and improved one of the sufferent themselves. and imprudence of the sufferers themselves.

It would perhaps, in some instances, be difficult to assert whether the greater negligence and indifference were displayed by those who erected temporary structures. or by those who daily and hourly risked their safety upon them.

one of the most important temporary terretures that has ever been erected, in whether its magnitude be regarded, or the length of time it has done duty, is Blackfriars Bridge; but in this, as in all similar instances, there is very little doubt of its security. Before any accommodation work can be placed at the disposal of the public, it is carefully examined and tested, and, if approved, certified by the proper authorities as fit for its intended purpose. The lives of the public are thus protected, in a great measure, from those contingencies which are attendant upon those descriptions of structures erected simply for the use of the operatives and labourers. We say, "protected in a great measure," because although a preliminary testing of any temporary One of the most important temporary a preliminary testing of any temporary public work is a wise precaution and a comparative safeguard against accidents, yet it is nothing more. Serious catastrophes have happened on lines of railways the day after they have been passed by the inspecting officer, and his examination, which embraces the permanent way, the work of construction, and the arrangement of the stations and signals, is conducted with great care, and a minute inquiry into the whole of the working and constructive details. That there has

erecting many examples of temporary construction will be apparent to anyone who regards the different principles upon which the commonest instance of all, namely, scaffolding, is at present put up. As a case in point, we might refer to that surrounding the partially built new hospital upon the south bank of the Thames at Westminster. It is impossible but to observe that there is a scientific distribution and arrangement of cross braces, struts, ties, and stretchers, to which, some years ago, builders and contractors were entire strangers. There are two chief reasons for these improvements and reasons for these improvements and departure from the old rule of thumb method. One undoubtedly is that builders and contractors, from the greatest to the least, have progressed in accordance with the spirit of the times. The other, that the introduction of heavy travelling gantries, steam cranes, and other powerful mechanical aids and appliances, has necessitated a more substantial and accomplished released a constitution. It would be and scientific plan of erection. It would be impossible to build houses similar to those now in process of construction upon the Marquis of Westminster's estate, with scaffolding designed after the ancient poles and putlog fashion.

While sometimes temporary works fail from sheer ignorance or parsimony on the part from sheer ignorance or parsimony on the part of those constructing them, at others they are the result of misfortune rather than of culpability. A notable instance of this description occurred some time ago, in the "blow" that took place in the dam erected to carry on the formation of the Thames Embankment from the Temple to the new Blackfriars Bridge. This dam was built in a manner nearly precisely similar to that under the protection of which the wall upon the south side of the river, from Stangate to the south side of the river, from Stangate to Lambeth, was so rapidly and so successfully constructed. If we do not mistake, the very same foreman of works was employed upon both jobs. In the former, there was no accident of any kind; in the latter, the dam failed, entailing considerable delay and loss upon the contractor. How is this to be accounted for? Were the conditions in accounted for? Were the conditions in the two cases similar, or only apparently so? The fact is, that the holding ground for the piles on the south or Surrey side of the river is much better than that upon the Middlesex share and apparently the depths to which shore, and consequently the depths to which they must be driven respectively to attain the same holding power is not constant, but varies considerably. The dam that failed between the Temple and Blackfriars would no doubt have held its own upon the opposite The same results were proved to obtain with respect to the nature of the foundations in the bed of the Thames, in getting in the piers for the new Blackfriars Bridge. and in one instance an extra depth of over 30ft. had to be sunk to, in order to find firm ground. Whatever negligence might be displayed in temporary works of lesser magnitude and importance, there is no lesser magnitude and importance, there is no contractor so blind to his own interest as to knowingly build his dam too slight, or even to risk the chance of a "blow" during the to risk the chance of a blow during the progress of the permanent erection. If a large dam were to fail en masse, unless the contractor were a man of considerable capital, it would almost be tantamount to a temperature of the works, since the loss would stoppage of the works, since the loss would be enormous, all of which would fall upon himself. Without intending for a moment to depart from the principles of strength and stability, there is nevertheless frequently a disposition to cut the scantlings down too fine, and endeavour to save labour and material in defiance of the consequences that may ultimately attend conduct so injudicious. It is, in the long run, never worth while to risk the chance of an accident for the sake the permanent way, the work of construction, and the arrangement of the stations and signals, is conducted with great care, and a minute inquiry into the whole of the working and constructive details. That there has been a great improvement in the method of

temporary works should be strong and sound enough to last the time they are intended; but it is also just as much to his interest that they should cost as little as possible, and, as these are rather conflicting, it is not to be wondered at that sometimes it is not to be wondered at that sometimes a mistake is made in their reconciliation which is not discovered until it is too late.

# AMERICAN ORDNANCE.

T may be within the recollection of our readers that a joint committee of the United States Congress was some time since appointed to enquire into and report upon the question of ordnance. Their object was to determine the value of the various systems of construction at present in use, as well as to investigate the practice adopted in procuring guns and stores for the Ordnance Department. The committee made their Department. The committee made their report on the 15th of February last, and the material portion of it comes to us through the American "Army and Navy Journal." The committee first review the various systems of ordnance adopted by European powers, and arrive at the conclusion that none of these systems have proved successful in preventing the bursting of guns, or in giving them uniformly reliable and years. in giving them uniformly reliable endurance.
The committee do not think it necessary to discuss further the various European systems of gun-making. None of them, say they, have shown exemption from the rule of failure, and experiments with them on the part of thier Government would be of doubtful value. In other words, the Americans are much obliged to us and other powers for the many thousands we and they have expended upon the question, and are so satisfied with the results that they do not desire to experimentalize in a similar direction. Their farfamed Rodman system of cast-iron guns proves to be no more satisfactory to them than other methods of construction, now than other methods of construction, now that they have resolved carefully, dispassionately and disinterestedly to investigate the whole matter. The Rodman system, say they, has had the merit of cheapness, and, when applied to smooth here gives had had when applied to smooth-bore guns, has had claimed for it superiority over European systems; but it must be considered to be equally tems; but it must be considered to be equally a failure with the others, especially when applied to rifled guns. The Chief of Ordnance of the Navy, in his last report, acknowledges this to be the case. He says:—"Opinions differ quite as widely in regard to the preferable mode of developing ordnance power, whether it shall be by smooth or rifled to the preferable mode of developing ordnance power, whether it shall be by smooth or rifled bores, by loading at breech or muzzle, made from iron, cast or wrought, or from steel, solid or in connected parts. The relation of mass to velocity is also unsettled. In fact, the question involves the necessity of going back to fundamental principles, and starting back to fundamental principles, and starting thence, by well-conducted experiments."

It appears then, that, notwithstanding a series of elaborate experiments, extending over a long period of years, and the practical experience of the recent war, the ordnance officers of the American Government have not yet determined upon even the funda-mental principles of their art, and possess no positive knowledge of the problem they have so long sought to solve. Each system of guns introduced into the American service has been subjected to proof tests which were supposed to demonstrate beyond question its supposed to demonstrate beyond question its ability to perform the work required of it. But what are the facts of the case as they stand revealed by practice? We turn to General Gilmore's able report upon the artillery operations of the war, and there we find that at Morris Island twenty-two large guns was the greatest number mounted at one

bombardment, forty-five men were killed and wounded, whilst only eleven are reported to have been killed and wounded by the enemy's missiles during the attack. The battle of Fort Fisher was the only occasion during the war on which rified guns of large calibre were fired rapidly and continuously for any length of time.

The reason why the weakness of these guns was not discovered before they were supplied for service, can only be referred to a defective system of proving them. The so-called proof was comparatively valueless, and was in no way a guarantee that the gun would perform in active use what was expected of it. Here, then, is clearly a defect in the organization of the Ordnance Department, which calls for a remedy. The causes which underlie and contribute to these results appear to be twofold. In the first place, the post of ordnance officers is secured to them for life, and, as a natural consequence, they have not, as a rule, that incentive to exertion and improvement which stimulates men under other conditions. Moreover, they have become attached to routine and the traditions of their corps, are jealous of innovation and new ideas, and slow to adopt improvements. As an illustration of this, we may mention the fact that the late war was fought with muzzle-loading rifleswith the exception of the cavalry carbines, which, we believe, were chiefly of the Spencer repeating pattern—although a variety of good breech-loaders were constantly urged upon the Government. In the next place, ordnance officers, are educated to a speci-alty, and consider themselves possessed of a perfect knowledge of their subject. They therefore regard private inventors and mechanics who offer improvements in arms as pretentious innovators who have no as pretentious innovation. They discourage rather than encourage the inventive talent of the country, which, from their position, they are enabled to repress, or more probably to another channel. Many complaints of improper and oppressive treatment have been laid before the committee by persons who have sought to draw the atten-tion of the proper authorities to what were supposed to be vital principles connected with their art.

The progressive development of the science of ordnance in America has been further and seriously retarded by the circumstance that prominent officers have been inventors of arms, and have possessed sufficient influence to secure the adoption and retention in service of their inventions, frequently without due regard to the question of real merit, and to the preju-dice of other and better devices brought forward by private inventors, or brought out in other countries. Then there is a still further difficulty which calls for a remedy, and that is, there are two Bureaus of Ordnance-the army and the navy—and there is a decided want of co-operation between them. Great diversity exists in the practice of the two branches of the service, respecting the arms adopted, and the manner of proving, mounting, and using the same. The calibres, models, chambers, and ammunition of the navy guns are entirely unlike those in use in the army. For example, the navy 12-pounder boat howitzer has a calibre of 3.4in., while the army 12-pounder guns are of the calibres of 3, 3.2in., 3.67in., and 3.8in. The chamber of the navy gun is of parabolic form, while the army gun has either a cycloidal chamber or none at all. The models of the The models of the two guns are none at all. entirely different, so that neither could be used on the carriage of the other, the army guns being furnished with trunnions, and the navy gun having, in some cases, the loop and loop-bolt of the old carronade. The system of sighting is also different, so that a gunner in one arm of the service, without special instruction, could not use a gun belonging to the other, one being graduated to seconds of time of the flight of the shot, and the other to degrees of elevation. The navy has 8, 9, 11,

and 13-inch smooth-bores, while the army guns are of the calibres of 6,8,10, and 12-inch, In the guns of the two branches of the service. there is no uniformity in either rifle or smooth-bore, in the twenty calibres adopted below the calibre of the 32-pounders. It is impossible to use navy ammunition in an army gun, or army ammunition in a navy gun. that, on all points, we find that co-operation between the army and navy while in active service is materially restricted, if not entirely prevented, on some of the most essential points. No advantages are claimed for this want of uniformity, whilst the disadvantages are numerous and patent to all. This has all arisen from the circumstance that officers in the two branches of the service have succeeded in securing the adoption of their own inventions. Hence, a rivalry has arisen between them, which has prevented fair com-petitive trials of the various devices and systems advocated by each, neither being willing to admit the merit of the other's inventions, nor to utilize the knowledge gained either by their successes or their failures. The experiments, being duplicated on account of this jealousy, have been, necessarily, needlessly expensive. A further increased expense results, in time of war, from maintaining two separate organizations for the procurement of The two ordnance departments are brought into competition with each other, in the matter of contracts and purchases of war material from the public work-shops and factories of the country, thus putting the Government in the attitude of bidding against itself. The upshot of all this is that whilst such a state of things is allowed to continue, no progress towards obtaining better guns is likely to be made. The committee, therefore, deem the best method of securing such impartially conducted experiments as will determine with certainty what are the best arms, and to insure greater economy and regard for the public interests in their purchase and adoption, is the formation of a mixed ordnance commission, composed of officers of high character, detailed from both the army and the navy, who shall have no interest in patents or devices for arms. The investigations of the committee lead them to the following conclusions:-

1. That no more heavy guns should be purchased for mounting in the fortifications or use on ship-board, until such improvements are made in the methods of fabrication as will insure more reliable endurance than has heretofore been exhibited.

2. That the Rodman system of gun-making, while partially successful in smooth-bores and small calibres, has so far failed in rifles of large calibre as to show it to be unworthy of further confidence. Recent improvements in defensive works and armourplating, render heavy rifled guns the most efficient means of attack, and no system of fabrication which does not furnish such guns should be adopted or continued. The principle of initial tension, which is the basis of the Rodman system, appears to be of doubtful utility, as applied by General Rodman, especially forrifled guns. This tension, it is admitted, gradually disappears from the gun with age, and in time is entirely lost.

3. That guns cast solid, in the manner practised in the navy under the direction of Rear-Admiral

3. That guns cast solid, in the manner practised in the navy under the direction of Rear-Admiral Dahlgren, while exhibiting satisfactory endurance as smooth-boros with small charges and hollow projectiles, have not the requisite strength for rifles of large calibre. This mode of casting seems to be defective in principle, as the tension inaugurated in cooling have a tendency to aid the powder to rupture the gun.

4. That experiments should be at once conducted for the purpose ascertaining the real cause of the bursting of heavy guns, and of determining upon some method of fabrication that will secure uniform endurance.

endurance.

5. That every encouragement should be given to inventors, and a full and fair trial accorded to all devices offered to the Government that promise a solution of the orderne problem.

devices offered to the Government that promise a solution of the ordnance problem.

6. That more efficient means for harbour defence should be adopted. The late war demonstrated that sand was the best material for defensive works, and that forts of masonry, such as we have now mainly to rely upon for the protection of our seaboard cities, are insufficient to prevent the passage of armoured or even wooden vossels. The destruction of such defence is only a question of time to ordinary guns of heavy calibre. It was also demontrated that forts alone, of whatever character, cannot resist the

entrance to harbours of powerfully armed ships, if the preponderance of guns on the assailing fleet is sufficient. In the opinion of the committee, obstructions must be largely relied upon for harbour defence, in connection with properly constructed fortifications.

7. That no officer of the army or navy should be allowed to receive a patent for any article required, or likely to be required, for use in those branches of the public service, or be in any way interested in the manufacture or procurement of such articles. It should be the duty of Congress to recognize by suitable rewards, the services of such officers as might make inventions of especial value to the Government.

ment.

8. That the Ordnance Department of the army can be entirely abolished with great advantage as to economy, and without detriment to the good of the service. The duties now performed by officers of that corps, could be performed by officers detailed from the artillery service, under the direction of a chief, stationed at Washington. In this manner, the whole expense of the Ordnance establishment would be saved, and artillery officers, who have not only scientific training but practical experience, would have a voice in the selection of the guns and ammunition they are required to use.

For the reasons we have given, the committee are of opinion that the interests of the public service demand a change in the system of procuring ordnance and ordnance stores, and the manner of conducting experiments, with a view to determining the value of the same. The present system has failed to answer the purpose for which it was designed, and the United States is in the position to-day of a nation having a vast coast-line to defend, and a large navy, without a single rifled gun of large calibre, and a corps of ordnance officers who have thus far failed to discover a remedy for the failure of the guns, or to master the rudiments of science in which they have been tried at the public expense. importance of an immediate change is shown by the fact that the Chief of Ordnance of the army asks for appropriations to purchase over 1,900 guns to arm the forts, not of a new and better system, to be decided upon after more thorough and careful experiment, but of a kind that experience has shown to be inferior in range and penetration to the guns of foreign powers, and unreliable as to endurance. It is proposed that fifteen of these guns shall be smooth-bores of 20in. calibre, 190 of 15in. calibre, and 600 of 13in. calibre.
The experience of all nations goes to prove that the most effective way of developing ordnance power is by rifled guns. To return to smooth-bores, throwing huge spherical masses of iron with low velocities, is to disregard all modern progress in the science of gunnery, and to return to the arms in use two centuries ago. Furthermore, the advisability of using guns of such great size is very doubtful, for the slowness with which they can be handled and fired makes them less effective than smaller guns delivering a more rapid fire. Two hundred of the guns required it is proposed shall be Rodman 12-inch rifles, notwithstanding all of that class of guns heretofore procured for the army or navy, and subjected to test, have either burst disastrously before the lowest reason-able test has been completed, or have given such indications of failing, after a few rounds, as to be considered unsafe. It is proposed also to purchase 610 10-inch Rodman rifles, although the committee cannot learn that any gun of this class has ever been subjected to test in this country, except the Parrot rifles of that calibre, which are acknowledged failures, having been condemned by both branches of the service. From the foregoing it is evident that we shall hear no more of the vaunted excellence of the smooth-bore system, with its heavy shot and charges; whilst a wholesome change appears on the eve of taking place in the administrative department of American ordnance. The committee have done good service to their country in drawing attention to the evils which beset the whole system of management,

volutionizing, not only the naval and military armament of America, but the character of its seaboard defences. ()fficial jobbery will—as far as official inventorship is concerned—cease, and a healty stimulus will be given to private invention—that is, if the Government will only treat inventors fairly and honourably, which in their present benighted condition it is worth their while to do.

#### THE ROYAL INSTITUTION.

AST week, on Tuesday afternoon, the Rev. F. W. Farrar, F.R.S., of Harrow School, closed his series of four lectures upon "Philology." On this occasion, he spoke of languages other than those belonging to the Aryan and Semitic families. Outside these two great families, there are a multitude of languages, most of them, to all appearance, isolated from each other, standing out like mountain peaks above the clouds and mists of antiquity. Most of these languages, especially those of savages, are barren of words, and too rude and uncouth to be at all fitted for the progressive tendencies of higher and more scientific races. Mr. Farrar, in speaking of the paucity of words in the languages spoken by most African savages, said that a great prelate told him that in the work of translating the Bible into one of these languages, the workers were constantly troubled by the lack of words capable of expressing the original meaning. The word "love" among others gave great trouble, and at last they obtained from the natives a word which all parties considered suitable, and it was inserted in the published version. Some time afterwards it was discovered that the word so chosen conveyed the idea to the natives of "meat in an advanced state of putrefaction." Mr. Farrar spoke at some length about the language of the Chinese, also of the Basque language, which, strange to say, has no Aryan roots, and is somewhat allied in structure to the languages spoken by the aboriginal inhabitants of America.

On Thursday, Dr. H. Power lectured again upon "The Eye." He said that all vertebrated animals are distinguished by the possession of only two eyes; the only known exception to this rule being in the instance of a fish found in the Mediterranean, which has about 1,000 undeveloped eyes arranged under its belly. In the course of the lecture he gave a minute description of the construction of the eyes of owls. The owl can enlarge and contract the pupils of its eyes at will, but the human being cannot.

On Friday evening, Dr. Crum Brown lectured at the Royal Institution upon "Chemical Constitution, and its Relation to Physical and Physiological Properties." Admiral Codrington presided. The lecturer dwelt for the most part upon one of the most obscure branches of molecular physics, namely, the probable changes of relation between the hypothetical atoms of compound bodies, when two such bodies enter into chemical union with one another. In the course of his lecture, he said that it is very difficult to estimate the relative volatibilities of chemical substances, because under varying conditions of. pressure, the relative volatility often changes. Thus, under very great pressures, benzole boils at a higher temperature than water.

On Saturday, Dr. William Odling, F.R.S., closed his series of ten lectures upon "Hydrogen and its Analogues." In this lecture he spoke principally of the properties of lithium, sodium, potassium, rubidium, cœsium, and silver as analogues of hydrogen. At first, he said, it might be thought that these substances have little in common with hydrogen, but it must be remembered, that recent researches have gone far to prove that hydrogen is a metal, with a boiling point very greatly below the temperature of the air. The six other metals just mentioned have the properties of uniting

with chlorine, bromine, and iodine, in exactly the same manner as hydrogen; in fact, hydro-chloric acid is chloride of hydrogen. Marsh gas, and substances of the paraffin series, possess many properties which are characteristic of hydrogen, so that in one sense, these compounds are analogues of hydrogen. Dr. Odling, among other experiments, exhibited the combustion of the very rare metal lithium, which burns with a steel-white flame, but when the oxide left after combustion, is ignited in the flame of a Bunsen's burner, it imparts a magnificent red colour to the flame. Potassium gives a slightly violet tinge to the light, which colour is easily masked by the traces of sodium liable to be present upon the mouth of the tube of the burner, or upon other objects which come into contact with the flame. The lecturer accordingly surrounded the flame with a double glass cylinder, the space between the two surfaces being fitted with a weak blue solution of indigo This cut off all the yellow rays, but transmitted the others. The characteristic colours of the lithium and potassium flames could then be seen, even when the light was strongly coloured by the presence of sodium. Dr. Odling closed by noticing the tendency of modern research to merge all the sciences into one, namely, into the "Science of Energetics."

The Royal Institution is closed during Easter, and the lectures will recommence on April 6. The session ends early in June.

# ALBINI'S SELF-REGISTERING COMPASS.

THE advantages of self-recording instruments are so great, and so well understood, that it is hardly necessary to say a word in their recommendation. By some, as in meteorological and astronomical instruments, the sources of error from human observations are altogether avoided, and an accuracy attained which no amount of attention on the part of the observer could possibly secure; while others act as checks upon carelessness and inattention, and, like the tables of the Recording Angel, display in indisputable characters the sins or virtues of a human and responsible agent.

In no case could such an instrument be of greater practical value than in furnishing a record of the course of a ship at sea. So much has this been felt, that many experienced officers, in our own and foreign services, have set themselves to devise an instrument for effecting the object in view. But as perfection is seldom or ever arrived at per saltum, it is no reflection upon those experimenters to say that their attempts in this direction have been only partially successful. It is unnecessary here to describe and to discuss the relative merits of the various means which have been adopted by the several officers who have occupied themselves with the subject, since the instrument we shortly describe and illustrate to-day is confessedly superior to any yet devised, and, indeed, seems to fulfil every possible requirement. A minute description of the various parts shown in the accompanying figures would occupy more space than we can possibly devote, so we content ourselves with indicating the principal parts, and leaving our mechanical readers to fill up the outline we trace by the aid of the drawings.

Figs. 1 and 2 show respectively the front and back elevations of a compass fitted with the self-registering apparatus, which has been invented by Captain Albini, of the Royal Italian Navy. Under the compass card, fig. 3, which is made somewhat larger than usual, is fixed a metallic ring, which is divided on its under side into the same number of points as those on the compass card. The ring is cast in a type mould, and each division is lettered to correspond with the direction of the compass card, which, fitted with the ring, is suspended in why.

the usual way upon a central pointed sup-This central support is fixed upon a port. metallic ring containing a clockwork arrangement. On the face of one of the frame plates (fig. 2) is a clock-dial to indicate the time, and on the opposite frame plate is a piston or rod (shown in fig. 1), which is geared to the clockwork, and made to rise and fall at fixed intervals. The upper part of the piston or sliding rod is made to project over the metallic ring before described. A little below the ring of the compass card when suspended, and at the back of the sliding rod, is a small horizontal elastic cushion. On each side of the elastic cushion, a pulley or drum is fixed, on one of which narrow slips of paper are coiled, while the other receives them as they are uncoiled from the first mentioned, by the action of the clockwork. Above the strip of paper, and in the same line, is a ribbon prepared with an indelible ink. These several parts may be somewhat varied at pleasure. Instead of casting letters upon the metallic ring, any conventional signs may be engraved; and in place of ink, chemical means may be used to leave an impression upon the paper. There can be no doubt, however, that plain lettering, corresponding to the points on the card, is infinitely preferable to any system of conventional signs.

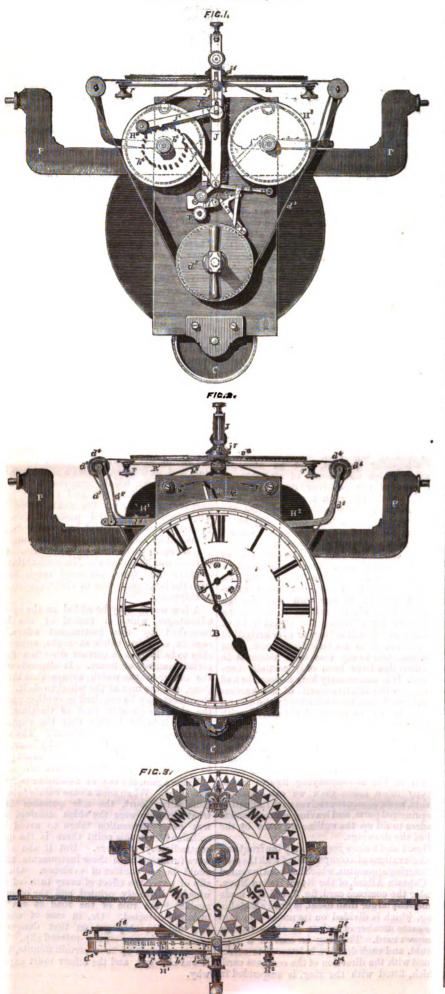
The action of the several parts of the machine is as follows :- At every minute or other fixed interval that may be arranged for, the clockwork causes the quick descent of the sliding rod, the projecting part of which pulls down the metallic ring of the compass card, and causes the types underneath it, in the direction of the ship's head, to press the prepared ribbon and paper slip upon the cushion. Thus the letters on the under side of the ring are printed upon the paper slip, and as the sliding rod is constantly pointing in the direction of the ship's head, the impression made corresponds to the course followed by the ship. After the paper slip has been impressed, the sliding rod rises slowly to its former position, and, as it rises, causes a slight rotation of the pulleys, which removes the printed part of the slip of paper, and brings a blank part into position for the next impression. These are the essential parts of this in-genious instrument, which has been seen and approved by most of our eminent marine engineers and experienced navy officers. of them was shown at the Marine Exhibition, at Havre, and there attracted much notice from the large concourse of visitors interested in shipping.

A few words may be added on the special advantages which a record of the kind furnished by this instrument offers. A captain, on going below at night, orders the ship to be kept in a certain direction for a certain number of hours. It depends upon the officer of the watch to see that this is done, and the men at the wheel to do it. But the officer may be required in another part of the ship the greater part of the time, and how is it to be known that the captain's directions have been carried out? The strip of paper shows it. Here, hour by hour, and minute by minute, is recorded the exact point to which the ship's head was directed.

Take, again, the case of a collision between two ships. When such a case comes into the Admiralty Court, the sole question is in what direction were the ships steering, and was every precaution taken to avoid the collision? On this point there is the usual contradictory evidence. But if the ships were furnished with these instruments, there could be no conflict of evidence. On the slip of paper the effect of every turn of the wheel is distinctly printed, and the offender against "the rule of the road at sea" is instantly detected. Or, in case of wreck, how did the ship get on that dangerous coast? It is seen on the printed slip. The course was safe up to a certain minute, then it was changed, and the officer must explain why.

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# SELF-REGISTERING COMPASS. BY CAPTAIN ALBINI, R.I.N.



Lastly, the permanent interest of the record is great. By the aid of these slips of paper, and the captain's observations, and provided with a chart, an owner may trace day by day and mile by mile the exact course of his ship throughout its entire voyage, and thus obtain information which the most carefully kept log-book would probably fail to furnish. We have only to add that the instrument here figured and described can be seen at Messrs. Elliott's, 449, Strand.

# THE INSTITUTION OF NAVAL ARCHITECTS.

THE ordinary annual meetings of this Institution were held on the last three days of last week, in the hall of the Society of Arts, in the Adelphi. The President of the Institution, Sir John Pakington, Bart., took the chair on Thursday morning at the first of the meetings. The proceedings were commenced with the reading of the annual report of the council by the hon. secretary, Mr. Merrifield. The chief points of interest in the report may be summed up in a few words. In the April of last year the Ministry allowed a grant of £250 to the Institution, in recognition of its great use and benefit to the nation, and especially to the shipping interest. A like grant has been allowed for the current year by the present Government. The course of study at the Royal School of Naval Architecture and Marine Engineering at South Kensington, which, from the foundation of the school in the summer of 1860, has consisted of three winter sessions of six months each (November to April inclusive) has been extended to four sessions of seven months each, the sessions to commence in October. The report concluded with a proposal to extend the full membership of the Institution to marine engineers, who heretofore have only been admitted as associates.

After some further formal business, the

President delivered his address. He stated that year by year he became more impressed with the importance of the Institution and of its fitness for the purposes for which it was intended. He congratulated the members on the prosperous financial condition of the Institution, and expressed his conviction that the fact of the grant of £250 having been made by two successive Governments for two made by two successive Governments for two successive years, was a guarantee that the grant would last as long as its requirement. After touching upon the different points mentioned in the report, the President lamented the comparative meagreness of the list of papers to be read at these meetings. Although many of the papers were of great interest and importance, there were others of no less importance, which were conspicuous only by their absence from the programme. He suggested that the council, before the He suggested that the council, before the next annual meeting, should take some steps towards procuring papers on all the subjects of highest interest to the naval architect, so that no subject of importance should not receive its proper share of attention. We think this suggestion of the President worthy of all consideration. It is a great pity that so many persons, to whom time is of great value, should be called together to deliberate upon what is in danger of being merely a fortuitous concurrence of atoms. What disgust must inevitably follow when men of ability arranges to describe the control of the co ability arrange to devote a morning, or, we might say, a day, to the meeting of an in-stitution like this, and find their pains rewarded by the opportunity of being spectators at the trotting out of the hobbies of incipient or disappointed patentees. How much better to ensure papers by able men, on really important subjects—subjects as far as possible removed from the Patent Office, subjects on which the individual knowledge subjects on which the individual knowledge and experience so published may be likely to be of true and lasting benefit to the profession, and the world at large. After this general regret at the absence of important

subjects, the President turned to one particular source of disappointment. "Within the last few days we had had from the highest possible quarters, novelties in the construction of powerful ships suggested, which might profitably form a subject of consideration by such a competent body of gentlemen as the members of this Institution." This reference was to the armour-clad vessels just proposed by the Government, which are to be of 4,400 tons, to draw 26ft. of water, to carry 1,700 tons of coal, to have no masts, and no rigging. It would be imprudent to condemn these novelties merely as novelties, yet the first impression in Parliament was one of doubt. There were important questions in-volved. Could a ship be safe under all circumstances without masts? and would not the expense of the coal required by these ships to enable them to keep the sea be enormous? The President thought it his duty to advert to this proposal, so novel and extraordinary in its character, and he expressed his fear that no paper on the programme would fairly open this subject for discussion. He thought it desirable that the able scientific men who met at these meetings should be in a position to turn their attention to these novel proposals of the Government.

Mr. Charles Lampert, in seconding the report, the adoption of which had been moved by the President, regretted that this Institution did not make some move as a body to advance their knowledge. He suggested the co-operation of the council in recommending to Government the necessity of instituting a series of experiments on the strength of masts, and also on the resistance of fluids to solid bodies moving through them.

In our next, we will proceed to give a resume of the several papers which were read at these meetings.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

THE PARIS EXPLOSION.

THE awful accident, which spread dismay and consternation among the inhabitants of Paris, near the Sorbonne, has called public attention to an explosive agent very little known. Of the millions who read the newspaper account of the explosion, very few had ever heard or read of picrate of potash; and to many, to whom the name was more or less familiar, it was a novelty to hear of it as an explosive agent. Under these circumstances, a few words respecting it may have an interest for our readers. Picric acid is really a body of the same constitution as gun-cotton and nitroglycerine, and its explosiveness might almost be inferred from its nature. It is directly prepared by treating carbolic acid with strong nitric acid, and, just as happens, when cotton and glycorine are treated with the same acid, three atoms of hydrogen are removed, and replaced by three atoms of nitrous acid. The picric or trinitro-phenylic acid thus obtained is a yellow substance, with an extremely bitter taste. It is largely used in dyeing, and sometimes, it is said, employed in bitter ales, but it is poisonous in moderate doses. When heated, it explodes, if confined, or deflagrates, with some violence, when exposed. It combines with almost all fixed bases, and forms salts, which are mostly of a yellow colour. All of these are more or less explosive, and most detonate sharply, when struck with a hammer. Picrate of potash is not the most explosive of these compounds, and it requires a tolerably hard blow on a firm anvil to make it explode. We are, therefore, disposed to reject that account of the accident which states that the cause of the explosion was a bag of the picrate thrown upon the floor of the warehouse.

M. Fontaine has been recently decorated by the Emperor of the French for the invention of a explosive agent to be used in torpedoes. But this agent, we believe, is not merely picrate of potash, which alone would have very little Telegraph Service.

advantage over ordinary gunpowder. The compound actually used is, we have reason to believe, a mixture of picrate of potash and chlorate of potash, a highly explosive and dangerous com-pound. Such a mixture is easily ignited, and detonates with extreme violence when only lightly struck. Private accounts which reach us when only leave no doubt that at the moment the accident happened the employés in the warehouse were engaged in sifting some materials together-the chlorate and picrate, as we conjecture—but still the immediate cause of the explosion remains a mystery. Anyone, however, who will make an experiment with a grain or two of the mixture we mention, will see that the ignition of a hundredweight of the compound would have tremendous results. At the same time, it must be stated that the explosion of an equal weight of nitro-glycerine would have produced about six or ten times the destructive effects, and the same weight of compressed gun-cotton, fired by a detonating fuse, would have been even more disastrous. M. Fontaine's compound, indeed, while dangerous to handle, is far inferior in destructive force to the no more dangerous nitro-glycerine. and also to gun-cotton, which is perfectly safe to stow and handle.

#### ELECTRICITY AND TELEGRAPHY.

WITH a view to the improvement of telegraphic communication in Turkey, in connection with through Indo-European messages, it is understood that the Turkish Administration are about to proceed immediately with the construction of a new direct line, to be used exclusively for Indo-European telegraph messages. This line will be from Nissa, through Servia, to the Turko-Austrian frontier, near Gradiska.

The steamer "Caroline," engaged for picking up the seventy miles of Persian Gulf cable, payed out from the "Calcutta," has had her machinery and fittings put on board, but her departure has been delayed by the late stormy weather. She went to sea on Sunday last, but on the following day put into Penzance with damaged machinery. Mr. F. C. Webb, C.E., superintends the necessary operations, and from his well-known experience in such matters, we hope soon to announce a successful issue to the expedition.

The progress of the French Atlantic cable continues in the same satisfactory manner. Of the main cable about 1,980 miles have been completed, and 600 miles of the St. Pierro and United States section. Coiling on board the "Great Eastern" is gradually going on, and up to the present time there is about 1,200 miles on board.

Soon after Easter it is anticipated the Government will bring in their "money bill" for purchasing the electric telegraphs of the kingdom. The arbitrations between the Post Office and the various companies is going on as fast as possible, and with the exception of that with Reuter's Telegram Company, are nearly concluded. The latter arbitration is lengthy, on account of the amount of scientific opinion brought forward respecting the quality and probable durability of the cable. It is necessary to determine the probable expenditure for future maintenance, before the amount for the purchase of the cable can be settled. On the completion of the arbitration, we hope to have some valuable information to place before our readers, on the probable duration of heavy submarine cables.

The forthcoming volunteer review will give an opportunity to our Royal Engineers' Field Telegraph Train of showing the enormous value to be derived from rapid signalling in the field, from point to point, of the position of a large army. A special party of Royal Engineers, under Captain Stotherd, R.E., comprising signallers, telegraphists, &c., with their waggons and apparatus, have received instructions from the War Office to proceed from head-quarters at Chatham to Dover, for the purpose of taking part in the volunteer review. On the troops arriving at their respective position, the telegraph lines will be laid down so that the general commanding may be able to despatch instructions to, and receive advice from, all points. For this purpose, signallers will be specially told off, to attend the various officers commanding divisions. We shall anxiously watch for the result of this practical trial of our Field

The following is an interesting experiment, lately performed by M. Poggendorff, upon the movement of mercury in a vacuum tube:—A tube of glass, provided with platinum wires at the ends, and containing some mercury, was exhausted, until as perfect a vacuum as possible could be obtained. In addition to which, by the application of great heat, the mercury was kept in a boiling state, until such time as, by inclining the tube, the mercury sounded sharp against the glass, a state that indicated the perfect condition of the vacuum. At a little distance from each end the tube was bent up at right angles, so that the platinum points were no longer in contact with the mercury. The tube was then hung, by means of hooks, to the electrodes of a Holtz machine, the tube being kept perfectly level, an operation rendered somewhat easy by the aid of the mercury inside. On passing a current from the machine through the tube, the mercury was immediately seen to travel with considerable speed from the negative to the positive pole, and whatever the direction of the current. the movement of the mercury was always to the positive pole. This movement was accompanied, but only visible in darkness, by a beautiful yellow fluorescent light on the negative end, and visible throughout the length of the platinum wire. The same light was also seen at the end of the mercury column, nearest the positive electrode, and continued to show throughout the forward movement of the mercury, until its arrival at the positive end. when it gave forth a brilliant light at the moment of arrival. A beautiful violet light, but not stratified, was visible throughout the rest of the tube occupied by the mercury.

#### PARLIAMENTARY NOTES.

IN the House of Commons, on the evening of this day week, Mr. Dixon asked whether an order for rifles had been received from the Indian authorities, and if so, for how many. From Mr. Cardwell's reply, it appears that it is intended to order 10,000 Snider rifles, and 1,200 arms of other classes, for India, to be supplied from the gun factories of London and Birmingham.

At the same sitting, Mr. Headlam asked the Under Secretary of State for Foreign Affairs what had been the result of the proceedings with the authorities of Spain concerning the destruction of the ship "Mermaid."

Mr. Otway said that the proceedings with regard to the "Mermaid" had been satisfactorily concluded. The work of the commissioners appointed to investigate the claim terminated on the 21st of last month. The decision was in favour of the claimants, and they were to receive £3,866 10s. 11d.; and, further, there was an agreement between the British and Spanish governments that the sum should be payable within 90 days. The decision had been considered satisfactory.

After this reply had been given, Mr. T. Hughes asked the Secretary of State for War whether a series of experiments were about to be made with a Whitworth 9-inch gun. Whether a new 9-inch gun was to be ordered of Mr. Whitworth, and, if so, at what price; and on what conditions as to delivery within a reasonable time. Whether any field guns were about to be ordered of Mr. Whitworth which were to be made of a peculiarly costly material, but otherwise in accordance with the existing Woolwich system; and, whether such experiments and orders were proposed or recommended by any professional department of the War Office or Admiralty.

miralty.

Mr. CARDWELL said that Mr. Whitworth had invented a new mode of making what was believed would be very valuable ordnance; and the Government applied to him for a small quantity of his material for use in the factory at Woolwich. He declined, however, to give the Government the use of his raw material; and he was then applied to, to know whether he would make them a gun of the size mentioned. He replied that he was willing to make the gun, and named the price. The Government had not at present accepted the offer, and consequently no arrangements had been entered into.

The question of the disposal of Portpatrick Harbour was opened by Sir J. Hay, who asked the President of the Board of Trade whether any

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course had been determined upon with respect thereto in consequence of the commissioners of supply in Wigtownshire having declined to accept the terms offered with respect to it by the board.

Mr. AYRTON said that in consequence of the local authorities not thinking it worth their while to take charge of the harbour, it became necessary for the Government to consider what should be done with the harbour. Before they could arrive at any conclusion, it would be necessary to obtain the opinion of the legal advisers of the Government upon many important questions, and until that opinion had been received, no decision could be come to as to what would be done with the harbour.

On Friday evening, Mr. Samuelson put to the Postmaster General a string of questions respecting the transfer of the telegraphs. He asked hether a valuation had been made of the total sum which would become payable to the various sum which would become payable to the various telegraph and railway companies in the event of the State purchasing their interests under the permissive act of last session, and whether he would lay that valuation upon the table; whether it was not the case that a large additional outlay beyond that sum would be required in order to complete the scheme of telegraphic communication contemplated by the Post Office; whether the amount of such outlay had been ascertained, and would be communicated to the House; whether the Treasury had caused an estimate prepared of the cost of an entirely new and distinct system of telegraphic communication on the most improved plan, under the management of the Post Office, and would communicate such estimate to the House; and, whether or not it was the intention of the Treasury to recommend that Parliament should vote funds for carrying out the permissive act of last session, as well as the ad-ditional funds which would be required to complete the postal electric system as contemplated by that act.

The Marquis of HARTINGTON stated that the valuation of the total sum that would become payable to the various telegraph and railway companies in the event of the State purchasing their interest, under the permissive act of last session, was in course of being formed. The arbitrations were in progress, and it would be impossible to state the values precisely until the arbitrations were completed. With regard to the second question, the fact was that an additional, but not very large, outlay would be necessary to complete the telegraphic communication needed by the Post Office. The amount had been proxi-mately ascertained, and in the event of the arrangement going on the particulars should be communicated to the House. As to the third question, the Treasury had not caused any estimate to be prepared, so that it could not be laid before the House. As regarded the last question, it would be premature to state what were the intentions of the Government till the negotiations were further advanced. He should, however, in a few days, be enabled to explain what were the intentions of the Government.

On Tuesday evening Sir L. PALE asked the Secretary of State for War, when the Cadastral Survey of the mining districts of England would be completed, and especially the mining districts of Devon and Cornwall, where there were the the richest mines of tin, copper, and other ores. Mr. Cardwell said the Cadastral Survey of the

mining districts had been going on in Denbighshire and other counties, but at present it was not decided when that of Devon and Cornwall would be commenced.

At the same sitting Mr. Collins asked the Secretary of State for War whether it was the intention of the War Office to supply the Snider rifle to all the militia regiments for this year's training; and, if to any, to what regiments, and upon what principle such distsibution would take place.

Mr. CARDWELL said that 23 militia regiments would this year be supplied with the Snider rifle, amounting to 16,879. The regiments that would be selected to receive them would be those which were going to Aldershot and Shorncliffe, and also those regiments which, during the last three years, had devoted themselves to rifle practice.

VERY numerously attended meeting was held at A VERY numerously attended meeting was need at Oxford, on Saturday afternoon, when it was resolved to invite the Royal Agricultural Society to hold their meeting for 1870 in this city. It was stated that upwards of £3,200 had been promised towards the expenses of the meeting. THE METEOROLOGICAL SOCIETY.

HE ordinary meeting of this Society was held at the Institute of Civil Engineers, on Wednesday, the 17th inst., at seven p.m., Mr. James Glaisher, president, in the chair. Two candidates were proposed for admission into the Society. A paper was read by the Rev. F. W. Stow, M.A., of Tunbridge Wells, "On Comparative Solar Radia-The author in this paper complains of the tion " utter want of uniformity in the methods employed by different meteorologists in registering solar radiation. He should have known, however, and acknowledged that this is a matter which has been pointed out in Casella's edition of Well's essay "On Dew," by Mr. R. Strachan, F.M.S. This want of system is owing to two distinct classes of errorfirst, the almost endless variety of thermometers employed; second, the absence of any rule as to employed; second, the absence of any rule as to their exposure to the sun's rays. After carefully considering the nature of the reading given by an ordinary blackened bulb thermometer—that it consists of the heat of the sun's rays plus the accumulated heat of the air, and of the glass of the thermometer, Mr. Stow recommends a plan by means of which the latter two may be eliminated, and the former be obtained in a better condition for intercomparison with reports from other With regard to exposure, the writer, for various reasons, prefers a uniform height of 4ft. from the ground to one at less height. He concluded by asking the co-operation of observers in bringing about some method of working, which must be preferable to the absence of any method as at present. The President entered at great length into an account of his own researches in this direction in the years 1840-4. He had no objection to the proposals of Mr. Stow provided they were in addition to the methods at present employed by the best observers. He had found that a thermometer placed at a certain height above the ground was not affected at all by the sun's rays, and gave simply the temperature of the air. Mr. Symons supported the plan of placing the thermometers 4tt. from the ground as one easily adopted by all, and as it got rid of the effect of the mist always in existence more or less at 1ft. or 2ft. from the ground. A paper was then read by Mr. Glaisher "On the Storm of February 12, 1869." In this communication, the track is marked out of a small but violent storm which passed up the English Channel with great rapidity, and was marked in its southern half by a sudden and violent shift of wind from S.W. to N.W., accompanied in many places by torrents of rain. The storm was somewhat circular, and its centre passed a little S. of London at about 5 p.m., advancing at a rate of about thirty-five miles an hour. Mr. C. Meldrum, the secretary of the Mauritius Meteorological Society, then read a brief paper "On the Rotation of Winds in the South Indian Ocean," additional to that read at the previous meeting; and this, again, was followed by a second communication from Mr. Glaisher, "On the Meteorology of 1867 and 1868," in which he stated that such continuous and extreme heat had not been experienced at the Royal Observatory during a period of ninety-eight years, and he believed it had not been equalled in any part of the country during the last hundred years. No discussion, however, followed any of these papers, probably owing partly to the fact that no one knew certainly what papers were to be read before they entered the room, and partly to the endeavour to read too much at one partly to the endeavour to read too much at one meeting, and partly to inaudible reading. In a science, such as meteorology, wholesome criticism and hearty discussion are likely to be of great service, and should be more encouraged than they

The meeting closed at a little before 9 p.m., but not before the President had promised the members two important papers on rainfall, in connection with the moon's age; one by himself, the other, by Mr. G. Dines, who has already written on this subject. On the whole, this was one of the most interesting meetings that the Society has had for some years, and the next promises to be equally successful.

THE LARGEST ROPE IN THE WORLD.

latest one is so extraordinary as to merit special commemoration. The rope, which is intended for shipment abroad, is 11,000 yards long, measures 5½in. in circumference, and weighs over 60 tons. These figures are enough to take one's breath away; but when we come to see how the monster is built up, there is cause for still greater surprise. The rope (made of Messrs. Webster and Horsfall's patent charcoal wire, laid round a hemp centre) consists of six strands, with ten wires in each strand. Each wire measures 12,160 yards; so that the entire length of the wire reaches the enormous total of 726,000 yards, or 412½ miles. To this has to be added the length measures 12,100 yards; so that the entre length of the wire reaches the enormous total of 726,000 yards, or 412½ miles. To this has to be added the length of yarn used for the centre—namely, twenty-seven threads, made from Petersburg hemp, each thread measuring 15,000 yards, and giving a total length of 405,000 yards, or about 230 miles. Adding together the wire and yarn, we have a grand total of 1,181,000 yards, or 635 miles of material—all going to make up a monster wire and hemp rope a little under 6 miles long. Such a rope certainly has never yet been made; and we doubt whether, excepting in Birmingham, such a one could be made. As it lies in vast coils in Messra. Wright's machine-room, it looks like a miniature Atlantic cable, multiplied by five times the cable thickness. Of course such a rope will bear an enormous strain, and its capacity in this respect is increased by the perfection of the machinery employed in the manufacture, giving the strands an exactly uniform "lay," and imparting the regularity and the precise angle of "twist," which experience proves to possess the greatest resisting and holding proves to possess the greatest resisting and holding strength.

FOUR-WHEEL COUPLED PASSENGER ENGINE—PARIS AND ORLEANS RAIL-WAY.

OUR large two-page engraving is taken from the detail drawings of one of the most recent types of French passenger engines for the ordinary work of the Paris and Orleans line. The system of placing all the gear outside, even in coupled vastly popular abroad. We cannot but think it riding the hobby of accessibility of parts to death, and believe it to be practised more because foreign engine-drivers, like foreign grooms, are not so nice in keeping what is committed to their charge as are English drivers, than from any preference to the plan on mechanical grounds. From the nature of the engravings no description will be necessary. The following are the principal will be necessary. The following are the principal dimensions:—Length of fire-box (external), 4ft. 2jin.; breadth of fire-box (external), 3ft. 10in., (internal), 3ft. 4in.; height of fire-box from main level of bars to crown, 4ft.; diameter of barrel of boiler (external), 4ft. 1in.; number of tubes, 180; length of tubes between tube plates, 16ft. 5in.; diameter of tubes (internal), 1½in.; length of smoke-box, 3ft.; diameter of smoke-box 4ft. 6in. diameter of funnel, 16in.; smoke-box, 4ft. 6in.; diameter of funnel, 16in.; diameter of steam dome, 35in.; height of steam dome, 3ft. 8in.; diameter of cylinder, 16in.; length of stroke, 25.6in.; length of cylinder. (internal), 31in.; length of piston, 4-7in.; clearance (collective), 7in.; length of connecting rods, 5ft. 9in.; length of coupling rods, 6ft. 8½in.; diameter of driving wheels, 6ft. 6in.; diameter of leading wheels, 3ft. 11in.; diameter of driving axles, 7in., in bearings, 7.25in., in bosses, 7.8in.; length of bearings, 9.8in.; diameter of crank pin in boss, 5.1in.; in bearing, 4.7in., in bearing of coupling rods, 3.9in.; length of wheel base, 12ft. 10in.; maximum steam pressure, 130lb.; total length over buffers, 30ft. 2in.; area of grate surface, 14 square feet; area of fire-box heating surface, 74 square feet; area of tube heating surface, 1,350 square feet; area of total heating surface, 1,424 square feet; thickness of boiler plate (shell), 5-16in.; thickness of tube plate, 9-16in.; total width, clear of eccentrics, 8ft. 6in.; diameter of feed-pump plunger, 54in.; stroke of feed-pump plunger, 4in.

THE MANUFACTURE OF WATCHES AND CLOCKS,

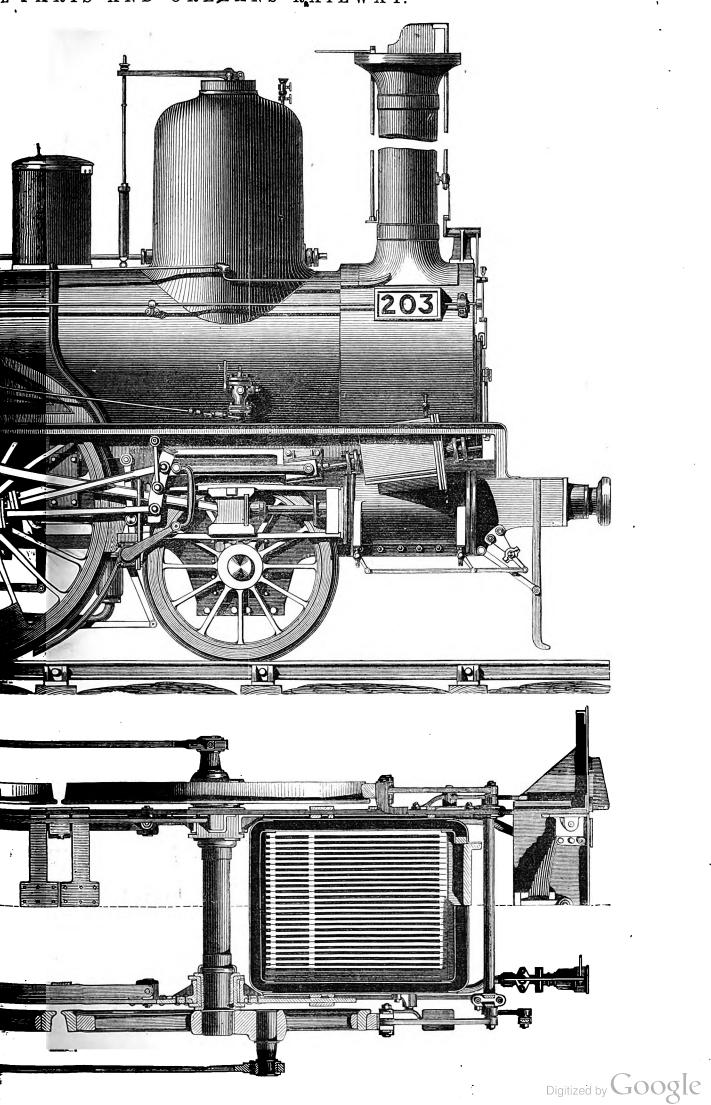
—A most interesting and instructive little work,
describing briefly, but with great clearness, the rise
and progress of watch and clock making, has just
been published by Mr. J. W. Benson, of 25, Old
Bond-street, 99, Westbourne-grove, and the City
Steam Factory, 58 and 60, Ludgate-hill. The book,
which is profusely illustrated, gives a full description of the various kinds of watches and clocks,
with their prices and no one should make a purphase The Language in the properties of the various kinds of watches and clocks, with their prices, and no one should make a purchase.

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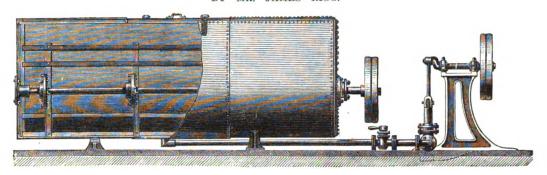
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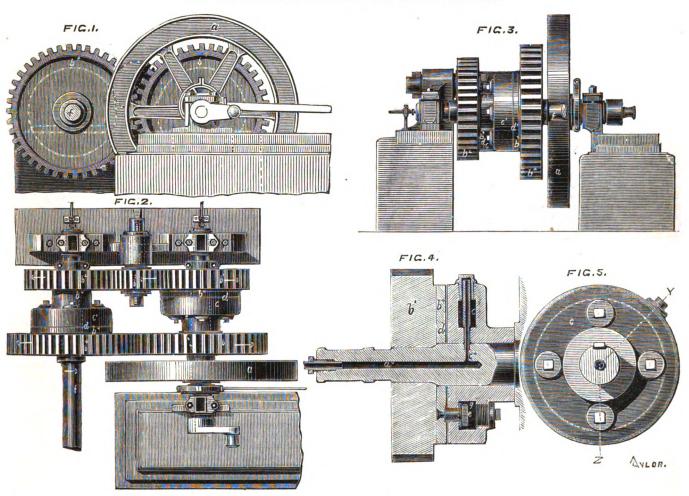
### HORIZONTAL OIL AGITATOR.

BY MR. JAMES RIGG.



#### FRICTION CLUTCH FOR DRIVING SHAFTS.

BY MR. F. W. KITSON AND MR. PIERRE CHALAS.



# HORIZONTAL OIL AGITATOR FOR MIXING LUBRICATION OILS.

THE demand long felt by manufacturers of all kinds employing machinery, for a really good lubricating oil, has led to the introduction of mineral oils on a large scale for that purpose. The very light specific gravity, however, of these oils has to a great extent confined their application as a lubricant to the lightest classes of cotton and silk machinery in consequence of the liability of the fluid from this cause to run from the bearings. Even for this purpose it has been with difficulty that the prejudices of manufacturers have been overcome. The result of many experiments which were tried was that by mixing these mineral oils with animal or vegetable oils the excessive fluidity was reduced, and they were found when mixed suitable for most lubricating purposes. Difficulty was, however, found in making a complete and intimate mechanical mixture, and various plans and contrivances have been adopted to thoroughly agitate and mix the mineral with the vegetable or animal oils. It is now admitted by oil manufacturers generally that the best form of agitator is the horizontal machine which is

illustrated in the annexed engraving, and which is manufactured by Mr. James Rigg, engineer, of Chester. It consists of a wrought-iron tank of suitable size, and having a semicircular bottom. A shaft passes through this tank, and carries longitudinal angle-iron beaters, as shown in the section. The oils required to be mixed are filled through the lid, which is made sufficiently tight to prevent any waste during the process of agitation. The machine is then set in motion, and in the course of a very short period the particles of oil are so thoroughly agitated that all liability to separate from each other is rendered impossible. By this means, the lubricating properties of the mineral oil are retained, and the difficulty caused by its running off the bearings is entirely obviated. A pump may be attached to the agitator, and used for throwing the mixed oils into the various store tanks, from which they may be drawn for use. The invention of this agitator has been the foundation of a most important branch of the oil trade, which is increasing in a surprising degree, and there can be no doubt that the mixtures of lubricating oils of which the mineral element forms the chief part, surpass any that have hitherto been discovered.

#### FRICTION CLUTCH.

MR. F. W. KITSON, the well-known engineer of Leeds, and Mr. Pierre Chalas, engineer, of the same place, have recently patented some improvements in friction clutches for driving shafts. It is a novel method of bringing the friction surfaces into contact so as to communicate motion from the shaft of the engine to the driving shaft of the machinery it is intended to actuate. In the accompanying engraving, we have shown an arrangement of mechanism which the inventors have in practice found most convenient. Fig. 1 is a side elevation of the friction clutch; fig. 2, a plan view; and fig. 3, an end elevation of the same. Fig. 4 is a vertical section of the hydraulic cylinder and the friction apparatus connected therewith, drawn upon an enlarged scale, and taken in the line Y Z of fig. 5, which is an end view of the clutch.

scale, and taken in the line Y Z of hg. 5, which is an end view of the clutch.

The flywheel a of the engine is keyed on a shaft shown by dots in fig. 2, and may be termed the driving shaft. On this shaft is also keyed the toothed wheel b and also the shallow hydraulic cylinder c shown detached at figs. 4 and  $4^a$ . Mounted loosely on this same shaft is another

toothed wheel b1, which is made with a flat friction surface  $b^*$ , seen best at fig. 4. d is the friction disc, which is secured to the pistons e c of the hydraulic cylinder, the water space of which is of annular form, as indicated by dots at fig. 4. The a water passage a\*, water or other liquid is supplied through this passage to the cylinder e from an accumulator or an hydraulic pump. A transverse passage c\* is drilled through the side of the driving shaft into the water passage a\*, so that upon opening a communeation between the pump or accumulator and the hydraulic cylinder c, water at a very high pressure will be admitted through the passages  $a^*$  and behind the pistons e, and will force them forward, and thus bring the friction plate d attached thereto into contact with the friction disc  $b^*$  on the side of the wheel or pulley  $b^1$ , which will thus be driven by the flywheel or driving shaft of the motive-power engine and through the intermediate wheel  $b^2$  to a similar toothed wheel  $b^3$ which is keyed on to the working shaft f, which will, therefore, be driven in the direction of the

Of course, if it be desired to adapt the invention to reversing gear so as to be able to drive the machine (to be actuated) in either direction, then there must be a double set of friction clutches, as shown at fig. 2. The reversing friction clutch will be similar in construction to the hydraulic clutch just described, but will act upon separate wheels. which are driven by the flywheel or other motive shaft in opposite directions.

It has been explained that the flywheel a and toothed wheel b being both keyed on to their shaft will constantly rotate in the direction indicated by the arrows, and by means of the friction clutch and toothed gearing just described will cause the working shaft f to rotate in the direction of the arrow marked thereon. But if the friction clutch e be released, the wheel  $b^1$  will be loose on the shaft, and as it then will not drive the wheels  $b \ge and b^3$ , no motion will be imparted to the working shaft f, and the latter will, therefore, remain stationary, although the wheel b which is mounted thereon will be driven in the direction of the arrow. If, now, it be desired to drive the working shaft f in a direction opposite to that indicated by the arrow, it will only necessary to allow water from the hydraulic pump or accumulator to enter the cylinder c 1, so force the friction disc  $d^{-1}$  up against the friction surface  $b^*$  of the wheel  $b^{-4}$ . This wheel, which was rotating loosely on the shaft, will, by means of the friction clutch  $d^{-1}$ , be firmly gripped, and will carry round with it the shaft f in the direction indicated by the arrow on the wheel.

In order to render the pistons of the hydraulic cylinder c perfectly water-tight, a thick ring or annular plate of vulcanized india-rubber is secured on the back of the pistons e.e., and is forced up against a shoulder in the cylinder, and when the pressure of the water is taken off the pistons, the elastic india-rubber ring g will force back the pistons and the friction disc d and thus release the clutch. It will be seen that if the working shaft is required to be driven always in the same direction, only one set of clutches will be required. namely, that shown at  $c^{-1}$   $d^{-1}$ , fig. 2. The wheel  $b^{-4}$  which carries one of the friction discs  $b^{*}$  will be constantly driven by the wheel b on the driving shaft, while the other disc d 1 is secured to the piston of the hydraulic cylinder  $c^{-1}$ , which is keyed on to the shaft f which is intended to be driven. We may add that this friction clutch has been regularly at work in Mr. Kitson's establishment— the Monk Bridge Iron Works, Leeds—for some time past. It has given such satisfaction that it is now being applied, on a large scale, to the reversing gear of heavy plate mills. It acts very perfectly, without noise or shock.

THE report of the committee of the Buffalo City Council, detailing negotations with the manager of the Grand Trunk Railway, relative to the proposed international bridge connecting Buffalo and Fort Erie, states that the city of Buffalo is to guarantee 6 per cent. interest on 1,350,000 dollars of capital for fifteen years; and, in return, the citizens of Buffalo are to be allowed to take an amount of stock sufficient to give them the control of the company. sufficient to give them the control of the company. There is a promise, too, that when the bridge is completed, the Grand Trunk Company will pay 50,000 dollars for the use of it. That promise, we "Toronto Globe," suppose, has yet to be ratified in England. If the other railway companies that are expected to use the bridge, do as well as Mr. Brydges promises that the Grand Trunk shall do, the people of Buffalo will not be likely to lose very much by the guarantee.

AMERICAN LOCOMOTIVES AND ROLLING STOCK.

BY MR. ZERAH COLBURN, M. INST. C.E. (Concluded from page 207.)

OF the mechanical details of American loco-O motives, considered apart from the details already touched upon, much might be said. There were differences, and they were numerous, but they involved no important principles. The chilled cast-iron wheel, however, for engine and tender bogies, and especially for carriages and waggons, deserved mention. No wrought-iron wheels, so far as the author could learn, were now employed in the States, unless in a few cases for engine driving-wheels; and wrought-iron wheels, at first exclusively adopted, had been wholly abandoned on the Grand Trunk and the Great Western railways of Canada. The cast-iron wheels were not only much cheaper, but they were more durable, and, if not safer, were at least equally safe. The wheels employed for passenger carriages were 2ft. 9in. in diameter, and weighed 5cwt. The bogic wheels of engines, tenders, and goods waggons were generally 2ft. 6in. in diameter, and varied in weight from 4cwt. to 4\chicut. They were cast of special mixtures of the best qualities of iron, the requisite conditions being great absolute strength to resist both sudden and progressive strains, and property of taking a deep and uniform chill. But little of the cast iron employed for wheels had a tensile strength of less than fifteen tons per square inch, and it broke with a fracture, almost suggestive of fibre, and of a dark grey colour, but when chilled of a silvery whiteness. The chilled wheels ran from two to six and even seven years, according to the traffic, before becoming so much worn as to require removal, representing a service of from 80,000 miles to 200,000 miles. Engine driving-wheels of from 4ft. to 5ft. in diameter, had been cast with chilled faces, thus requiring no tyres, and chilled tyres, from 4ft. to 6ft. in diameter, and 31 in. thick, had been extensively and successfully employed at fair rates of speed, say twenty-eight miles an hour.

Wood was almost exclusively employed as fuel, except upon two or three important lines in the coal districts, until within the last ten or twelve Iron fireboxes and copper tubes were then generally adopted; but for burning coal, steel fireboxes and iron tubes were now used. Of upwards of 400 steel fireboxes in the engines of the Pennsylvania Central Railway, some had been in use for six years or more. The tubes were set without ferrules, and very little trouble, as the author was The tubes were set without informed, was experienced either from leaking or cracking. It was worthy of observation, that the cracking. It was worthy of observation, that evil of "furrowing," by no means uncommon in the States, and no other explanation appeared available, than that the thinner iron employed there permitted of a certain elasticity in the structure of the beiler, sufficient to prevent the localization or accumulation of bending or other strains at particular points, or rather upon particular lines of resistance.

What were now understood as steep, or exceptionally steep, gradients were rare in the States. Some instances of such were cited, and it was mentioned that, in July, 1836, one of Norris's engines, weighing 6 tons 8½ cwt., and drawing behind it, including tender, a load of 8 tons 11½ cwt., ascended an incline near Philadelphia of 1 in 14, and 933 yards long, at an average speed of  $15\frac{3}{4}$ miles an hour. The nominal weight on the driving wheels was 31 tons, but it was believed that a portion of the weight of the tender was made to bear upon the footplate, thus increasing the adhesion.

With regard to the expense of maintenance, it was stated that the average cost of engine repairs in the States, exclusive of those renewals which amounted to building a new engine, might be taken as a maximum at 10 cents currency per train mile. equal to 33d. in coin. Of this, the absolute difference in the cost of labour and materials would account for nearly or quite 1d., leaving 24d. to 8d as the cost at English prices. Again, the manner in which these repairs were conducted showed a want of system and organization, and the shops were not fitted with some of the appliances considered essential in this country. Whatever economy in repairs might attach to the American engines was due, after allowing for the moderate working speed, to three causes only, viz., the use of the bogie, of chilled cast-iron bogie wheels (which could be renewed at a cost of from £2 to £2 10s. each, after allowing for the value of the wheel taken out as old iron), and of steel or iron fireboxes and iron tubes. About twelve or fifteen years ago, the average mileage of American engines, taking the full stock of the leading lines,

was not above 15,000 miles yearly,probably not far short of 20,000 miles, and on some lines it might be even more.

There remained the consideration of the carriage and waggon stock, with reference to its mechanical peculiarities and its commercial relation to traffic. The earlier American carriages were made upon the English model, but it was found, not only that a short wheel base was required for six-chain and nine-chain curves, but also that side buffers aggravated the difficulty. The bogic, already in use on the engines, was, therefore, adopted for the car-riages, and it was soon discovered that the length of body could be considerably increased, and that the longer it was the steadier it became. But the long bodies precluded the use of side buffers, and so central buffer with a loose coupling took their place. End doors afforded an obvious means of economy in the structure of the carriage, and left the whole depth of the body below the windowsills available for any combination of trussing. most effective for carrying a comparatively long The end doors, with a continuous passage span. throughout the carriage, afforded obvious facilities for communication. The central passage required an additional width of carriage, and from 9ft. to 9ft. Gin. was a common outside width; while, in some cases, even on the narrow gauge, a width of more than 10ft. had been adopted. These widths allowed seats for four passengers across, and for the longitudinal passage dividing the seats. The seats had reversible backs, so that the passenger might face either way, the carriages running in either direction without turning.

It was undeniable that the seating was not so roomy and comfortable as in an English first-class carriage, and that, as compared with a secondclass carriage, there was a certain loss of space. It was equally undeniable that such carriages could never answer for short traffic lines, where forty, fifty, or more passengers had to leave, and as many more to enter in a minute or a minute and a half. The long body, however, with end doors and platforms, possessed obvious mechanical advantages. Its length gave steadiness, and the depth below the window sills afforded ample opportunity for providing vertical stiffness with-out undue increase of weight. There were no cross partitions; there were but two doors, where English carriages would require, for the number of seats, according to class, from twelve to twenty-six; there was much less sash and glazing. while there was at the same time more light : there was an important saving in respect of draw-springs, buffers, buffer-rods, and screw couplings, and there was every facility for applying brakes, as was always done in the States, to every wheel in the train, either from the Platform of the carriages themselves or from engine. It was an advantage of the long body. with its corresponding weight and number of wheels, that the application of the brakes, how-ever suddenly, did not produce the jolting of which passengers complained so much when the same thing was attempted upon English carriages. Passenger carriages upon the double bogie plan were made of various lengths, from 45ft, to 60ft., exclusive of the additional 2ft. 6in. at each end for platform and covering porch. They accommodated from sixty to eighty-four passengers, and weighed, empty, twelve tons and upwards, or from sixteen tons to twenty-two tons leaded. Some notice was next given of Pullman's hotel car, and of the carriage, built by Messrs. Winans, for the Emperor of Russia. The improvements which had been effected in the engine and other bogies were then alluded to, and a description was given of the oil-tight axle-box, as well as of Loughridge's and of Creamer's continuous

In comparing the cost of maintenance of American carriage and waggon stock with that on English lines, many considerations were to be regarded. To say that the cost, in 1867, on the 1.612 miles of railway in the State of Massachusetts, for a train mileage of nearly 10,000,000 miles, was 6.55 cents, currency, or about 21d. coin train mile, did not permit of any according train mile, did not accurate In the States, the average number deductions. of passengers continuously carried over the whole distance made by a train was generally onehalf greater than in England, although the proportion of dead weight to live load was probably nearly as high as in this country. The speed was less, and there remained the fact that labour and nearly all materials were much dearer. On the other hand, there was a considerable saving in the use of chilled cast-iron wheels, such a thing as a wheel-turning lathe for carriage or waggon stock being unknown in the States. The

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maintenance of buffer and draw springs cost much less. The maintenance of the carriage bodies was cheaper, from their great strength and simplicity of structure, and from the fact that

there were no side doors to slam.

One objection to the use of chilled cast-iron wheele, not referred to in the earlier portion of the paper, was that, being almost necessarily of the disc form, their weight increased in a ratio nearly as the square of the diameter, and thus the largest railway carriage wheels yet employed in the States were but 3ft., and this size was long ago discontinued in preference for 2ft. 9in. In the case of cast-iron spoked wheels, the chill was less hard opposite the ends of the spokes than elsewhere, and thus they soon showed flat spots.

It might be said, in conclusion, that if American railway practice were in any or many respects more daring than that which prevailed in this country, failure, if not too often repeated, was regarded in the cousin country as a misfortune, where here, unless it proceeded from causes absolutely beyond provision, it was rightly regarded as a fault, a misdemeanour, or even a

# FARADAY AND HIS SCIENTIFIC DISCOVERIES.

By Mr. W. H. PREECE.

A N interesting lecture, illustrated by experiments A material recture, inustrated by experiments, was delivered in connection with the Southampton Polytechnic Institution at the Hartley Hall, on Wednesday evening, by Mr. W. H. Preece, on "Faraday." Mr. Alderman Stebbing (the president on wednesday evening, by Mr. W. H. Prece, on "Faraday." Mr. Alderman Stebbing (the president of the institution) occupied the chair, and there was a very numerous attendance. The lecturer commenced by stating that he was going to tell them of the life of the son of a blacksmith, Michael Faraday, who was born on the 22nd of September, 1791, and died on the 25th of August, 1867; The greatest experimental philosopher of this or any other ago. His education consisted of little more than that of the elements of reading, writing, and arithmetic, acquired at a common day school; but our progress in life does not depend so much upon what we learn at school as upon what we teach ourselves at home, self-education is the secret of all success. At the age of thirteen Faraday was apprenticed to a bookbinder and stationer, and he took every advantage of the opportunities which he thus possessed of examining beautiful. secret of an success. At the age of thriteen rariads was apprenticed to a bookbinder and stationer, and he took every advantage of the opportunities which he thus possessed of examining books. The perusal of "Watts on the Mind" first made him think, and that was the commencement of his career. His attention was turned to the science which he adorned so brightly by an article on electricity in an encyclopædia which he was engaged to bind, and he delighted also to read Mrs. Marcett's work on chemistry. Faraday, writing in 1858, said that in the books which he read after work he found the beginning of his philosophy, and he added that there were two that specially helped him—the "Encyclopædia Britannica," from which he obtained his first notions of electricity, and Mrs. Marsett's work on chemistry. Faraday could trust to facts, and always cross-examine assertions, and in these lay the whole secret of his success in life. Speaking of his early experiments, Faraday said, "I made such simple experiments in chemistry as could be defrayed his early experiments, Faraday said, "I made such simple experiments in chemistry as could be defrayed in their expense by a few pence per week, and I also constructed an electric machine, first with a glass phial, and afterwards with a real cylinder, as well as other electrical apparatus of a corresponding kind." He also attended some evening lectures on attend with publication with the sum of the sum o kind." He also attended some evening lectures on natural philosophy; and how he employed himself when seventeen or eighteen years of age might be gathered from a manuscript volume of his, which he called the philosophical miscellany, and which consisted of a collection of notes of occurrences in the arts and sciences, collected from the public papers, magazines, and other works. Faraday attracted the notice of Sir Humphrey Davy—also a self-made man—who succeeded in obtaining for him a situation at the Royal Institution, in 1813, as laboratory assistant, at a salary of 25s. a week; and Faraday remained connected with the institution till the day of his death, fifty-four years afterwards, of his death, fifty-four years afterwards,

When twenty-two years of age he travelled with When twenty-two years of age he travelled with Sir Humphrey Davy on the continent, and, in 1816, Faraday published his first paper in the "Quarterly Journal of Science," relating to an analysis which he had made of some native caustic lime from Italy. At this time he rendered himself so useful and invaluable that his salary was raised to £100 a-year. In 1821 he married, and on Christmas Day of that year he succeeded in making one of his original electrical experiments, that of the rotation of a magnet around a current of electricity. The particular net around a current of electricity. The particular branch of eletricity to which this experiment be-longed only dated from the commencement of the present century—and was sometimes called galvanism and sometimes voltaic electricity. It is produced through a piece of zinc. Zinc, copper, acids, and other chemical solutions, combined in various proportions and orders, form a battery, a term applied

te several cells. Take a simple glass, in which they would place a piece of zinc, and opposite it a piece of copper, and then filling the glass with water diluted with acid, they got a galvanic cell, and by various methods he could tell that they had got electricity flowing there, for if he put his tongue there he could feel it. If he put two other wires in connection with the two first, many of them would see contain motion on the table, and it was simulated. nection with the two first, many of them would see a certain motion on the table; and it was simply by repeating this process that they obtained electricity for telegraphic and other purposes. But how did they make this evident? By showing the great fundamental property of the electric current. That current invariably has a kind of sympathy (displayed in action) with things that associate themselves in a different way; and whenever a wire possesses a current of electricity it causes the magnet to set itself at right angles, while it can be made to rotate round the wire. The mutual action of

inagnet to set itself at right angles, while it can be made to rotate round the wire. The mutual action of electric currents and magnets was of the greatest significance to scientific men, and it is remarkable as being the subject of the first experiment that Faraday effected in electricity.

In 1824 he received the Victoria Cross of scientific men; he was made an F.R.S.; from 1824 to 1829 papers, lectures and researches in almost every chemical and physicial subject occupied his attention, and in the last named year he received the blue ribbon of the lecture table; he was selected to deliver the Bakerran lecture before the Royal Society. the Bakerran lecture before the Royal Society. In 1830 Faraday had accomplished enough to establish himself upon the roll of scientific fame. He had made two great discoveries, that of electric magnetic rotation, and the condensation of various gases into liquids. In one of Faraday's first experiments on the liquefaction of gas no less than thirteen pieces of glass were driven by an explosion into his eye. About this time he discovered benzone, the basis of aniline; and in 1831 he commenced those experiments at researches which immortalized him, and which he continued without intermission him, and which he continued without intermission till 1856. They consisted of twenty-nine series, which are published in three massive volumes—the most valuable addition to electrical lore ever produced—upsetting many well established notions, discovering innumerable fresh properties, proving the truth of contested facts, inventing new methods of operation, and bequeathing to posterity new sources of power.

sources of power.

The lecture then glanced at a few points connected with the science of electricity as treated upon by Faraday in the three volumes he had mentioned, by raraday in the three volumes he had mentioned, and having referred to the principle of induction, drew the attention of his hearers to the distinction between static and dynamic electricity, showing that thunder and lightning were a form of static electricity. The dynamic form of electricity is distinguished chiefly by the great property it possesses of producing magnetism. A specimen of Faraday's induction coil was displayed to view. It Faraday's induction coil was displayed to view. It is constructed so that when the current has passed through one wire, we have evidence of another current in the wire alongside of it. And it was this curious fact that first attracted Faraday's attention. Faraday, at the time he was making all these discoveries, was only receiving £100 a year; but in 1833 he obtained an extra £100 owing to the munificence of Mr. Fuller, who endowed a professorship to that amount. Faraday not only showed the connection between electricity and magnetism, but he also brought his mind to bear on the power of electricity in relation to chemical action. magnetism, but he also brought his mind to bear on the power of electricity in relation to chemical action. Whenever a current of electricity is allowed to pass through any chemical compound, it at once tears that compound asunder into its constituent parts; and Faraday showed that the amount of chemical action which takes place is exactly equivalent to the strength of the current which passes through.

In 1863 Faraday was appointed to an important post in the Trinity House, and the amount of work he did in examining cotton, oils, and in various

post in the Trinity House, and the amount of work he did in examining cotton, oils, and in various ways, was perfectly astounding; while his electric light was now being used for our lighthouses; it was already in existence in one of them, and was being applied to five more. In 1841 Faraday found it necessary to go abroad for the sake of his health, and spent some time in Switzerland. Many illustrations of his character were given, and his method of transacting business was commended to all. His instructions to his instrument maker were:—I. Whatever you make for me charge such a price as Whatever you make for me charge such a price as to make it a pleasure for you to work for me.

Never let a bill run over three months. 3. When you want your money come to me. He was an other than the control of the c

before Him who is Lord of all, and hope to wait patiently for the time and mode of release according to His Divine Word—his gracious and precious promise, whereby His people are made partakers of the Divine nature." He had not long to wait, for in August, 1867, this great, this good, this brilliant man passed silently and gently away, without a murnur or a pang, to that "country from whose bourne no traveller returns."—(Loud applause.)

The experiments exhibited were of a highly interesting and gratifying character, and at the close of the lecture Mr. Alderman Stebbing proposed a cordial vote of shanks to Mr. Precee for his excellent lecture, which was carried by acclamation, and the company separated.

We may add that the experiments exhibited were of a highly interesting and gratifying character.

of a highly interesting and gratifying character.

#### THE ROYAL POLYTECHNIC INSTITUTION.

DROFESSOR PEPPER and his able staff are preparing a variety of novelties for the Easter holiday folks. The most prominent and interesting of these is a new induction coil, which is the largest that has ever been made. This coil is 6ft. long and 18in. in diameter; the primary wire is 3,370 yards, and the secondary wire 150 miles 3,370 yards, and the secondary wire 150 miles long. It has a condenser of 1,500 superficial feet, and the apparatus weighs just 1 ton. On Tuesday evening Professor Pepper gave a private view of this splendid apparatus, and made a series of tentathis spicial apparatus, and made a series of tenta-tive experiments, which served to illustrate its power, although it was not then in thorough working order. It gave sparks of great beauty 30in. in length; these sparks were varied, some being straight and others feathered. Sparks were also sent along a wire, arranged in a pattern across the end of the theatre. Experiments were made with twolve Loyden jars, 18in. in height, and containing 40 superficial feet. With these wires of iron, zinc, brass, and copper were rapidly melted. The induction coil—which was manufactured by Mr. Apps, of the Strand—will prove one of the leading attractions at the Polytechnic during the approaching holidays.

# RELATION BETWEEN METEORS AND COMETS.

A N interesting scientific fact is becoming the subject of attention, as to the relation between meteors and comets. Dr. Bedford (a gentleman well known in the scientific world, and who stood for the city of Chester at the last general election), published and entered at Stationers' Hall, in 1854, a pamphlet, entitled "New Theories of the Universe," in which and entered at Stationers Hall, in 1894, a pamphlet, entitled "New Theories of the Universe," in which he stated that there was a relation between meteors and comets, and that both move in orbits. This discovery was made by a careful comparison of the records of these bodies from the earliest times. Also, in refutation of the then existing theory as to the physical constitution of the solar orb, he affirmed advanced views as to its igneous nature, which were at the time, like the theory of Galileo, scouted by the other philosophers of the day. Recent experiments, however, says the "Wiltshire County Mirror," have not only proved the truth of Dr. Bedford's theories, but they have been acknowledged, for two successive years (1867-68), by Professor Pepper, in his Lenten Lectures on Astronomy, at the Royal Polytechnic Institution, London, as forming the groundwork "of the grandest system of astronomical science," and "well worthy of being studied." The subject is now looked upon as highly important in a scientific point of view, and is likely to lead to a complete revolution in the science of astronomy. complete revolution in the science of astronomy.

### EARTHQUAKE-PROOF ARCHITECTURE.

THE recent earthquakes on the Pacific coast have necessitated the adoption of some THE recent earthquakes on the Pacific coast have necessitated the adoption of some new style of building in that section of the country. Mere bricks shells will not stand many heavy land shocks, so the "New York Times" states, that the architects of San Francisco are now busy over earthquake-proof plans of architecture. The last severe earthquake in that city cracked a large number of brick walls, which have had to be braced together with iron rods to make them in any way safe. A very little heavier shock would have tumbled them in ruins. The fact that these sensations may come at any time, has somewhat shaken the faith of the people in the security of their brick houses. One of the new plans proposed is to build a compact wooden frame structure, and surround it with brick walls. The frame would secure it against falling, and the walls would render it fireproof. A large publishing-house in San Francisco is soon to erect a store upon this plan. Another method 2. Never let a bill run over three months. 3. When a minently religious man. The spirit of the Gospel, inculcated by the pious example of his parente, ran through his whole life, and showed that the pursuit of science was not incompatible with Christian conduct. When Faraday had reached the allotted span of life—threescore years and ten—gradually and surely his powers failed him, he became feebler and feebler, and his bright, cheerful face was missed from his accustomed seat. In the summer of 1867, at Hampton Court—at a house provided by her Majesty herself—he sat at his window viewing the beautiful clouds tinged by the rich purple of the setting sun, when a friend from London asked him how he was, "Just waiting," he replied; "just waiting." This he more fully expressed—"I bow this matter, and a new field is open for the ingenuity

of architects. Anybody who will guarantee to put up a house that will stand an ordinary earthquake without damage, whether it be built of wood, stone, iron, paper, or rubber, can make his fortune on the Pacific coast. As soon as such buildings can be devised, earthquake insurance companies will doubt-less be established there to satisfy individuals who have not complete faith in the stability of real estate on the Pacific coast.

# Correspondence.

DETERIORATION OF SUBMARINE CABLES. TO THE EDITOR OF THE "MECHANICS' MAGAZINE." SIR,-Will you allow me to make some further

SIR,—Will you allow me to make some further remarks on the durability of submarine cables.

The Dover and Calais cable is perhaps the very worst instance that can be taken of a submarine cable. It is the first cable that was ever laid and kept in working order, and thus cannot have the benefit of the improvements which have been introduced in the manufacture of cables, and which have so greatly added to their durability. It was laid under a narrow and shallow channel; consequently, is liable to be continually injured, if not broken, by anchors; and, what is even more important, the movement of the water caused by waves must, where it is so shallow, extend to the bed of the Channel where the cable lies; this movement in the water causes friction, which gradually wears the cable away, and friction, which gradually wears the cable away, and lets the water into it. This, besides producing decay, affects, if not entirely destroys, insulation. You state that the Dover and Calais cable has been repaired about thirty or forty times, and that

You state that the Dover and Calais cable has been repaired about thirty or forty times, and that there is now only a little more than one-half of the original cable down. I will assume that, during the seventeen and a-half years it has been laid, the repairs and renewals have averaged 30 per cent. of the receipts (which is six times the ordinary per centage), and the working expenses another 5 per centage), and the working expenses another 5 per cent.; this would only be 35 per cent. of the receipts, whereas the entire working expenses of the Electric and International Telegraph Company for the year ending June 30, 1868, were 57½ per cent. Thus, to maintain and work a cable under the worst possible circumstances costs 22½ per cent. less of the receipts than is required with the very best land lines.

The arguments in my pamphlet with regard to the relative cost of maintaining land lines and submarine cables referred more particularly to deep sea cables, and I still think that cables laid at such depths as the Atlantic cables stand but little chance of being broken and deteriorated. There cannot possibly be any movement in the water where it is so deep. Anchors are not likely to be lowered to such depths, and icebergs do not measure miles above the surface

Anchors are not likely to be lowered to such depths, and icebergs do not measure miles above the surface of the water, consequently will not measure miles below the surface; and, as the chief ingredient of a cable is gutta-percha, which is supposed to be impervious to the effects of water, it is only the decay of time that has to be feared. The decay of time is so slow that I do not think anybody need trouble themselves about the destruction of the Atlantic cables for the next fifty or sixty years. I may say that I think the shallow water portions of the Atlantic and other cables will often require repairs and renewals for the reasons abovementioned.

reasons abovementioned.

Hoping you will again find space for my remarks,

—I am Sir, yours, &c.,

J. WAGSTAFF BLUNDELL.

49, Chancery-lane, London, March 22.

[We give insertion to Mr. Blundell's letter with
no further observation than that the writer appears
to be beyond the reach of conviction.—Ed. M. M.]

### A TWIN GUN.

A TWIN GUN.

SIR,—On reading in your last issue a description of a twin gun by Mr. H. W. Reveley, my first impressions were that it, at any rate, had the claim of novelty, if not of efficiency. Still, I had my doubts on the matter, for I fancied I had seen a similar weapon described elsewhere before. On looking over my papers, I find this to be the case. During the American war, certain reports upon the proceedings of the United States Government appeared over the signature of "Orpheus C Kerr" in a New York weekly paper. In one of these reports (which have since been published collectively by Mr. Hotten, of Piccadilly), trials of various newly-invented guns are described. I send you the report in question, which is dated August, 1861, and from which you will see that the following is faithfully transcribed:—

"The next weapon tried was Jinks' double back-action revolving cannon for ferry boats. It consists of a heavy bronze tube, revolving on a pivot, with

of a heavy bronze tube, revolving on a pivot, with both ends open, and a touch hole in the middle. both ends open, and a touch hole in the middle. While one gunner puts a load in at one end, another puts in a load at the other end, and one touch hole serves for both. Upon applying the match, the gun is whirled swiftly round on a pivot, and both balls fly out in circles, causing great slaughter on both sides. This terrible engine was aimed at the target with great accuracy, but as the gunner had a large family dependent on him for support, he refused to apply the match."

Mr. Reveley's gun has two touch holes, and the chambers are separated by a wall of metal. With these two slight exceptions, I do not see much difference between Mr. Reveley's and Mr. Jinks' guns. I am, Sir, yours, &c., March 22. VIGILANS.

THE SEA TORPEDO.
SIR,—I have received a letter from Mr. Romaine in acknowledgment of and in reply to my letter on the above subject to Mr. Childers of the 6th inst., a copy of which you inserted in your last issue. I do not know that it is the correct thing to publish Mr. Romaine's letter; I am, however, I presume, at liberty to state what I think of its tenour. I would, therefore, remark that the employment of torpedoes in future wars is clearly admitted by the Admiralty—the arm is acknowledged by our war authorities as an arm adopted; and the Admiralty assure us that the arm is so well understood that it can be immethe arm is so well understood that it can be immediately brought into operation in the event of war. If such is the fact, I cannot understand the policy of continuing to build monster war vessels. Taking a common sense view of the matter, it appears to me that such a course is unfair to our country, and, moreover, cruel to our seamen; for, should we be engaged in war with a maritime state, our seamen will, in our monster vessels, have, at a great disadvantage, to encounter an arm in which the hostile state will, in all probability, be better practised than ourselves

to encounter an arm in which the hostile state will, in all probability, be better practised than ourselves by reason of being in possession of a really practicable sea torpedo for sea service, with vessels, also, adapted to its application.

With regard to the personal knowledge which the individuals of the Board of Admiralty have of the sea torpedo, I should state that Mr. Childers, the First Lord, has not seen it in the water, nor has he even seen it out of the water; he cannot, therefore, know anything personally of its management or performance. The First Sea Lord has no more knowledge of the subject than Mr. Childers; the Junior Sea Lord had accidentally a glimpse of the sea torpedo. But Rear-Admiral Astley, C.K., C.B., Acting Director-General of Naval Ordnance, pro-Acting Director-General of Naval Ordnance, pronounced the sea torpedo, after having thoroughly inspected it, the best he had seen.—I am, Sir, yours, C., John Harvey, Captain R.N., 5, Keynsham Parade, Cheltenham, March 20.

# Megal Intelligence.

VICE-CHANCELLOR'S COURT. FEB. 19. (Before Vice-Chancellor Sir W. M. JAMES.) SPARAGNAPANE V. COOMBS.

Mr. E. Cutler moved ex parte on behalf of the plaintiff in this case for an injunction to restrain an infringement of his registered design for oysters

The plaintiff, who is a wholesale confectioner in Bishopsgate-street, invented in October an ornamental sweetmeat purporting to represent the real native of Whitstable, and had registered his design, which included a motto containing the usual coup-The ornamental oyster proved a great succe and, according to the allegations, the defendant, who is a confectioner, also earrying on business in Bishopsgate-street, was infringing the plaintiff's copyright by selling ornamental oysters closely resembling those manufactured by plaintiff, but, according to the usual allegation, of a very inferior quality and lower in price.

The Vice-Chancellon (after having been re-

ferred to the Copyright of Designs Act, 5 and 6 Victoria, cap. 100,) granted an interim injunction, upon the usual undertaking by the plaintiff to be answerable in damages.

This registration was effected by Messrs. Robertson, Brooman, and Co.

### TO CORRESPONDENTS.

THE MECHANICS MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly, payable in

of £1 is. 8d. yearly, or 10s. 10d. nan-yearly, payeous advance.
Alliliterary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

faith. ED. M. M.
Advertisements are inserted in the MECHANICS' MAGA-ZINE, at the rate of 6d, per line, or 6d, per line for 13 inser-tions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise-ments.

P. G. M.'s letter is so illegible that neither we nor our rinters—who, like ourselves, are accustomed to queer riting—could decipher it.

RECEIVED.—H. W.—G. H. P.—R. M.—F E.—R. J. G.— J. B. and Co.—J. P.—W. M.—M. and Sons — J. W. B.— W. T. F.—R. M. B.—J. N.—S. W.—J. H. T.—T. W.— P. G. M.—L. S.—R. J.—T. F.—N. A.—G. E. J.—J. W. M.— B. S.—W. J. F.—J. G. W.—E. S.—G. W. H.—W. B.— R. N.—P. H.—W. H. P.—A. Bros.—G. S.—R. J.—T. R.L. —J. F.

# Habal, Military, and Gunnery Items.

Admiralty order has been issued for the assembling of a reserve squadron at Portland during the Whitsuntide holidays. The cruise, it is stated, will probably last a fortnight.

18 stated, will probably last a fortnight.

The Hamburg-American Company's screw steamship "Holsatia," Captain H. Rhiers, which arrived last Thursday evening from New York, made the quickest run ever accomplished from that port to Southampton. She left New York at 5 p.m. on the 9th inst, and arrived off Cowes at 8 p.m. on the 18th, making the passage in 8 days 22 hours, allowing for difference of time.

The Board of Trade have awarded a telescope to Captain T. Van Eyk, of the Dutch schooner "Adriana Wilhelminas," for his services to the crew of the sloop "Luna," of Hull. The "Luna" was stranded on the Hasborough Sand on the 12th was stranded on the Hasborough Sand on the 12th ult. The crew escaped in their own boat, and, after seventeen hours exposure, were picked up in an exhausted state by the "Adriana Wilhelmina," and were landed on the 15th ult. at Hellevoetsluis.

MESSRS. W. DENNY and BROTHERS have launched Messrs. W. Denny and Brothers have launched an iron screw of 1,700 tons, named the "Glenartney." She will be fitted by Messrs. Denny and Co. with direct-acting surface-condensing engines of 300 horse power nominal. Messrs. W. Simons and Co., of the London Works, Renfrew, have launched an iron screw of 600 tons burden, and of the following dimensions:—Length. 170ft; breadth, 25ft; and depth, 21ft. This steamer is constructed with a spar-deck fore and aft, so as to protect cattle, goods, passengers, &c., in the wildest weather.

The contract for the erection of a new lighthouse and lighthouse-keepers residence at Souter Point, near Sunderland, has been let to Mr. Todd, builder, of South Shields, for £8,000.

THE death of Mr. William Patterson, who for many years carried on an extensive business as a many years carried on an extensive outsiness as shipbuilder at Bristol, is announced as having taken place at Liverpool, to which town Mr. Patterson had recently removed. Mr. Patterson was builder of "Great Western," the first steamer that ever crossed the Atlantic. He also built the steamer "Great Britain.

THE following iron-screw steamers belonging to THE following iron-screw steamers belonging to the Romlay Marine have been advertised for sale at Bomlay on April 1st, viz:—The "Earl Canning," 661 tons, and 150 horse power, built at Port Glasgow by Robert Duncan and Co. in 1866; "Lord Elphinstone," 654 tons, and 150 horse power, built at Port Glasgow by Blackwood and Gordon in 1866; and the "Sir John Laurence," 577 tons, and 70 horse power, built in London by Simpson and Co. in 1865. The makers of the engines of the two first named vessels are Messrs. Blackwood and Gordon, while Messrs. Rennie of London made those Gordon, while Messrs. Rennie of London made those of the "Sir John Laurence."

DURING the month ending January 31 in the current year 2,959 vessels entered, and, 2,954 vessels cleared at ports in the United Kingdom, representing totals respectively of 912,739 tons and 1,027,628 tons. Of the foreign vessels entered, 43 were Russian, 14 Swedish, 84 Norwegian, 90 Danish, 78 Prussian, 26 Hanoverian, 122 Dutch, 260 French, 30 Spanish, 42 Austrain, and 27 American. These numbers ahow an increase, as compared with the corresponding month of last year, by 708 vessels Spanish, 42 Austrain, and 27 American. These numbers ahow an increase, as compared with the corresponding month of last year, by 708 vessels and 120,075 tons. An analysis of those entered shows that 1,951 were British and 1,008 foreign vessels, and of those cleared that 2,027 were British and 927 Foreign. A total of 261 vessels arrived during the same month from British possessions, of which 40 came from North America, 78 from the East Indies, Including Ceylon, Singapor, and Mauritius, 9 from Australia, 11 from the West Indies, and 123 from other ports, representing a decrease of 51 vessels as compared with the January statistics of last year. A total of 334 vessels cleared to British possessions, 8 of which were bound to North America, 91 to the East Indies, 25 to Australia, 47 to the West Indies, and 163 to various other ports, showing also a slight comparative decrease. A total of 10,773 vessels were entered and 10,413 cleared of those employed in the intercourse between Gteat Britain and Ireland. course between Gteat Britain and Ireland.

# Miscellanea.

The number of visitors to the Patent Office Museum, South Kensington, for the week ending March 20, was 2,563. Total number since the opening of the Museum, free daily (May 12, 1858), 1,522,067.



THE Metropolitan Board of Works have elected r. T. W. Keates to the post of gas examiner for a Mr. certain portion of the metropolis, under the terms of the gas legislation of 1868.

THE Oastler memorial, which consists of a colossal figure in bronze, of the late Mr. Richard Oastler and two factory children, is to be inaugurated at Bradford, on Saturday, the 15th of May

At the meeting of the Institution of Civil Engineers on Tuesday, the 23rd inst., Mr. C. H. Gregory, President, in the chair, his Majesty Napoleon III., Emperor of the French, was elected by acclamation an honorary member.

M. DE LESSEPS has at length been rewarded for his skill and perseverance. On Wednesday week, the waters of the Mediterranean were admitted into the Bitter Lakes with complete success, and the Suez Canal may now be considered un fait accompli. We congratulate M. de Lesseps on the successful world to this great undartaking. result of his great undertaking.

MR. JAMES SIMPSON, an eniment hydraulic engineer, and once president of the Institute of Civil Engineers, died recently at Surbiton. Under his direction, the water supply of many of the continental towns was carried out, and the Bristol Waterworks was planned by him, and constructed under his carreit related. his superintendence.

As a sample of the honorarium paid to artists who are at the head of their respective classes, it may be worth recording that Mr. Sims Reeves, the vocalist, and M. Blondin, the rope-dancer, each receive a hundred pounds or guineas, for a performance at the Crystal Palace. Mr. Charles. Dickens, it is said, eceives the same sum for each of his readings in London.

THE number of visitors to the South Kensington Museum during the week ending March 20, 1869, was—on Monday, Tuesday, and Saturday (free) from 10 a.m. to 10 p.m., 9,438; Meyrick and other galleries, 1,830; on Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. till 5 p.m., 1,752; Meyrick and other galleries, 133; total, 13,153. Average of corresponding week in former years, 11,209. Total from opening of Museum, 8,242,277.

THE chair which is left vacant in the French Academy, section of music, by the death of M. Berlioz, is No. 5. and was occupied successively by two comedians, Preville and Grandmesnile; then by Berton, in 1816, and by Adolphe Adam in 1844. The others are at present filled by M.M. Auber, Carafa, Ambroise Thomas, Reber and Gounod, Among the candidates to succeed M. Berlioz are mentioned M.M. Felicien David, Victor Masse Maillart, and Rever. Maillart, and Reyer.

GLASS panes, constantly exposed to the action of the sun and rain, are soon deteriorated, as the potash or soda they contain combines with the carbonic acid of the air. A whitish opakeness is the consequence of this action, and in order to make the pane return to its pristine transparency it should first be rubbed with dilute hydrochloric acid, and then cleaned with moistened whiting. By this means it is said that glass in an extreme state of decomposition may be completely restored.

An agent of an American paper-mill has been in New Brunswick purchasing wood, to be shipped to Philadelpha. The "St. John's Telegraph" says the agent has already contracted for 3,000 cords of white birch and spruce wood, which is being got out on the Bay of Fundy Shore, more particularly in Westmorland. Samples of excellent paper made from poplar may be seen at that office. The New Brunswick wood will go into the States free of duty, being for manufacturing purpose.

a recent meeting of the Manchester Literary At a recent meeting of the Manchester Literary and Philosophical Society, a nest of one of the mason apiders from St. Thomas was exhibited by Mr. Sidebothom. Its form was that of an irregular tube, composed of clay and bits of stone, rather more than 3in. long, and 1sin. diameter, this is lined with fine silk. The cover is formed of similar clay and bits of stone, and has a very beautiful and durable hinge of silk fibres. When the nest is built in a hollow on the ground, and the lid closed, it would be next to impossible to detect it, and the lid fits so beautifully that no rein could an enemy that no rain could penetrate, nor could an enemy without great difficulty open the lid from the outside.

THE imported sparrows are good colonists. In spite of the tremendous snow storms they still manage to keep up undiminished numbers. A Canadian paper states that there are now about twenty birds, which may be seen daily in and about the Artillery Barracks. Their utility is more particularly observable at this season of the year; the hot sun vivilies insect life for several hours of the day, when from their semi-torpid state they become an easy prey to birds: the eyes too, of the cateran easy prey to birds; the eggs, too, of the cater-pillar tribes are approaching maturity. A little bird, therefore, such as the sparrow or the black-capped titmouse, can commit great havor among what will become insects at a later period. an easy prey to birds; the eggs, too, of the caterpillar tribes are approaching maturity. A little bird, therefore, such as the sparrow or the black-capped titmouse, can commit great havoc among what will become insects at a later period.

The use of petroleum as fuel seems to have given excellent results applied to domestic purposes. A vapour cooking stove, invented by Mr. Thome, has

been exhibited to the American Society for the Advancement of Science and Art. The fuel used was Advancement of Science and Art. The ruce used was petroleum refuse, and the danger of explosion is obviated by the use of wire-gauze, as in miners' safety-lamps. The oven is said to attain a baking heat in from one to two minutes, and bread, apples, and potatoes were baked, as well as a stake cooked, in the presence of the meeting. Several who had tried the stove, expressed a favourable opinion as to its operation. operation.

At the last monthly general meeting of the Zoological Society of London, Mr. Robert Hudson, F.R.S. in the chair. Sir Joseph R. B. Bailey, M.P., Colonel Alexander R. Manson, Major Thomas Bott, Captain Alexander P. B. Baillie, Captain Maxwell Goad, Miss Helen Scott, Mrs. F. Keymer, and Messrs. Edwin Jarrett, J. W. Humphrey, Charles Dod, Edmund Green, Zouch Turton, John Lambort, Charles C. Downes, John Rowland, Robert A. Newbon, Thomas G. Barclay, John Colebrooke, Robert H. Hall, R. L. Henry, Edward Bower, David J. French, John K. Smythies, John Sykes, William R. Mitchell, George Plomer, Frederick H. T. Streatfield, J. F. Barelli, and Charles Wheen were elected Fellows of the society. Twenty-nine candidates for the Fellowship were proposed and ordered to be balloted for at the next monthly meeting. AT the last monthly general meeting of the Zoolomonthly meeting.

The exports of coal from the United Kingdom in the first month of this year showed some decline as compared with January 1868. Thus the total shipments in January were 623,647 tons, as compared with 675,170 tons in January, 1868, and 560,890 tons in January, 1867. The exports of coal to France in January were 167,914 tons, as compared with 170,895 tons in January, 1868, and 159,312 tons in January, 1867. The exports increased in January to Russia, the Hause Towns, Italy, and the United States; but they decreased to Denmark, Sweden, Holland, France, Spain, Brazil, and British India. The value of the coal exported in January was £315,341, as compared with £356,121 in January, 1868, and £301,014 in January, 1867. In these totals, France figured for £75,809, £80,678, and 76,894 respectfully. THE exports of coal from the United Kingdom in respectfully.

# Patents for Inbentions.

### ABRIDGED SPECIFICATIONS OF PATENTS.

PATEN 15.

BOILERS AND FURNACES—2770, 2774, 2776, 2784, 2787
BUILDINGS AND BUILDING MATERIALS—2738, 2750, 2757, 2659, 2760, 2762, 2764, 2798
CHEMISTRY AND PHOTOGRAPHY—2778
CULTIVATION OF THE SOIL, including agricultural implements and machines.—2736, 2759, 2786
ELECTRICAL APPARATUS—2723, 2740
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper. &c.—2730, 2731, 2741, 2755, 2765, 2784, 2788, 2790, 2791, 2802

FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2730, 2731, 2741, 2755, 2765, 2784, 2788, 2790, 2791, 2802
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2799
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—2751, 2756, 2783
GENERAL MACHINERY—2732, 2737, 2775]
LIGHTING, HEATING, AND VENTILATING—2742, 2745, 2748, 2794

METALS, including apparatus for their manufacture-2761, 2797. 2803

2761, 2797. 2803
MISCRLLANEOUS-2749, 2752, 2754, 2763, 2766, 2767, 2773, 2778, 2782, 2796, 2800, 2801
BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2735, 2747, 2768, 2771, 2790, 2792

SHIPS AND BOATS, including their fittings-2743, 2753,

SHIP ARE 2785, 2789, 2772, 2777, 27J9, 2778, 2789, 2772, 2777, 27J9, 2780, 2795 Warfare—2744

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective and a subject to which the respective neutions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

ment:—
2730 G. TRAVIS, J. CHADWICE, and J. LAW, Bochdale
Carding engines. Dated September 4, 1868.
The patentees propose to fix thin flat guides between the
doffers and the strippers. These guides are placed between
the rings on the doffers with the flat side towards the
doffer. By this means, the slivers are more effectually
separated. They also place two rollers (fluted or plain)
between the stripper and the twisting straps, to take the
slivers from the stripper and carry them to the twisting
straps. They also place guides between these rollers and
the twisting straps for the slivers to pass between. By
these means, there are less breakages and better work
produced.—Patent abandoned.

wheel; the cam actuates a parallel rod, imparting thereto a horizontal two-and-fro motion. The rod gives motion to a catch lever, working on a stud near the middle of such lever, the lower part of which has a slot hole.— Patent abandoned

2732 J. SPROUL, Hadley. Water power. Dated September 4, 1868.

The patentee proposes to return to the employment of the old-fashioned waterwheel, in lieu of steam, for working machinery.—Patent abandoned.

2733 W. E. Newton, Chancery-lane. Thermomaters.
Dated September 4, 1863.
The object of this is to indicate automatically, and at any distance, changes of the thermometer proper, which actuate dials, bells, or other indicating apparatus, thus showing the variations of temperature.—Patent completed

2734 J. PARKER, Camberwell. Motive power. Dated September 4, 1868.

The patentee proposes to reheat or superheat steam and air, combined together, by forming the pipe by which the steam and air is conducted from the nozzles to the cylinder or receiver with one or more angles, elbows, bends, or curves.—Patent abandoned.

2735 S. SHARROCK, Liverpool. Metal telegraph posts
Dated September 4, 1868.
The central uprights of telegraph posts are made of iron
or steel, in convenient lengths, of tubular form, the lengths
being attached by means of flanges, which only require
bolting or riveting together. In the case of telegraph
masts, as well as the signal masts, where considerable
height is required, the patentee trusses or braces the
central uprights by means of iron or steel truss rods
which are tightened and adjusted by means of stretching
screws.—Patent completed.

screws.—Patent completed.

2736 T. Perkins, Hitchin. Straw elevators. Dated September 4, 1868.

In order to elevate a cut crop from the ground on which it lies, on to a waggon or cart, the patentee employs an elevator, consisting of a trough-like frame, having, as in an ordinary elevator, pulleys at each end of the trough, around which endless chains pass. These chains carry cross laths, with teeth upon them, which travel along the trough. The trough is creeted in an inclined position, and with its lower end foremost it is drawn over the land. Inclined rake teeth are fixed at the front end of the trough, and these points rest on the land. The crop, as the machine meets it, rises up the inclined teeth, and from the top of this incline the elevating chains take the crop, and carry it to the top of the trough, where it is discharged.—Patent abandoned.

discharged.—Patent abandoned.

2737 J. Pickering, Durham. Raising and lowering Dated September 5, 1868.

The patentee uses two pulley wheels, which are placed together on a spindle, in a frame. These two pulley wheels are made of unequal diameters. The periphery of the small wheel is made with sunken chambers, to receive the links of a single chain, which hangs down to raise weights. Sometimes the two wheels are made separate, with grooved or bevelled faces, whereby the one is secured to the other by friction. On the other side of the large or driving wheel a clutch is fitted, which is made in the form of a wedge or inclined plane, on the face. Against this is another clutch, fastened to the spindle or axis, fitting the face of the former named wedge or incline plane, and to this clutch a ratchet wheel is fitted, with a pawl, to cause the same to run one way only. This ratchet wheel, together with the clutch, prevents the weight, when raised, from slipping down.—Patent completed.

2738 R. BANKS, York. Floor dog or cramp. Dated Sep-

2738 R. BANKS, York. Floor dog or cramp. Dated September 5, 1868.

On the joist, or other support, the patentee places a frame, having at one side a stationary plate, provided with a number of pointed pins; the plate is pinched up to the joist or support, by means of a lever and eccentric, or by a screw, so that the frame shall be effectually fastened.—Patent abandoned.

2739 T. Howcroff and A. M'Gregor, Lancaster Reaping machines. Dated September 5, 1868.

This relates, first, to reaping machines, having one main driving wheel only. The gearing actuating the knives is contained within and shielded by a dished or dome-shaped cover or case, cast together and forming part of the framework of the machine. The lower and forward end of this framework is cut with a flange, to which the finger bar and sleeve are bolted.—Patent abandoned.

J. L. PULVERMACHER, Regent-street. Electricity.

Dated September 5, 1868.

The patentee forms cylinders from open worked copper Dated September 6, 1868.

The patentee forms cylinders from open worked copper plates, or from copper wires worked into the form of cylinders; these cylinders are provided with tubes to allow of their being connected together by insulated bent pins or wires to form a chain; these pins or wires put the copper cylinders into metallic contact with solid or hollow zinc cylinders into metallic contact with solid or hollow zinc cylinders after the latter have been provided with threads or other insulating material; the zinc cylinders are sufficiently long to extend beyond both ends of the copper cylinders. In order to keep up the supply of the exciting liquid to the elements thus formed, and at the same time keep dry the outer surface of the copper, a caoutchouc tube is employed carrying small T-shaped pipes, which are placed on the tops of the zinc cylinders, but do not touch each other. Exciting liquid is supplied to the caoutchouc tube, and issues through holes into the T-pipes and runs down continuously between each zinc cylinders and the surrounding copper. The elements can be connected so as to form a chain, the links of which are insulated from each other; both the zinc and the copper cylinders are provided with movable rings, each having a projection at one part of its circumference, by means of which the contacta, either in the sense of tension or of quantity, may be established, by moving the rings into a position to bring all the copper cylinders and all the zinc cylinders into contact, whereby electrical quantity is obtained, or by moving the rings so that the projection on the ring of each zinc cylinder ot the adjoining elements, whereby voltaic contact and intensity are obtained.—Patent completed.

2741 J. Sloper, Walbrook. Perforating tickets. Dated September 5, 1868.

2741 J. SLOPER, Walbrook. Perforating tickets. Dated September 5, 1868.

The patentee employs a hanging or vibrating frame, and



aforcing red or plunger, carried and guided longitudinally by cams. The die or matrix is caused to move towards the forcing red or plunger, such motion being derived from the red itself through lever arrangements in connection, the effect being to halve or reduce the extent of motion of the red, which would otherwise be necessary, and so to produce a quick and powerful action.—Patent abandoned.

produce a quick and powerful action.—Patent abandoned.

2742 W. H. Chispin, Stratford. Artificial fuel. Dated
September 5, 1863.

The fuel is formed by taking about 1 ton of coal in a
pulverized state, and adding thereto about 6 or 7 per cent.,
by weight, of pitch, the same having been previously dissolved in about an equal weight of crossote or "heavy"
oil, resulting from the distillation of coal tar, or in any
hydrocarbon fluid or fluids possessing similar solvent
powers. The coal and pitch having been thus combined,
about 3 per cent., by weight, of lime, and 3 per cent. of
chioride of sodium (common salt) are added.—Patent
completed. completed.

completed.

2743 W. E. Newton, Chancery-lane. Ships' compasses.
Dated September 5, 1868.

This consists of a combination of three or more systems of magnetized needles or bars attached to one or more axles, and arranged in different horizontal planes. The first or upper system of magnetized needles consists of two bars parallel to each other, with similar poles in the same direction, and parallel to the systems of magnetized needles below, when there is no disturbing cause to move them from the magnetized needles or bars consists of two (or more) magnetized needles or bars thed in a frame which may be attached to a vertical axle (or shaft) and he movable up and down the same, or the frame may be adapted to uprights or pendant rods on which it may be amoved up and down.—Patent completed.

2744 T. Wilson, Birmingham. Firearms. Dated Sep-

adapted to uprights or pendant rods on which it may be moved up and down.—Patent completed.

2744 T. Wilson, Birmingham, Firearms. Dated September 5, 1868.

To the trigger guard at the rear of the trigger is jointed a hinged plate or flap, the plate or flap being similar to an ordinary sight leaf, and capable of a similar backward and forward movement. In order to secure or fix the trigger, the plate or flap is turned forward so that its free end rests or abuts against the shank of the trigger, thereby preventing the movement of the trigger, and, consequently, the accidental discharge of the firearm. It also consists in constructing the foot or upper end of the trigger so as to make it bear firmly upon the sear guide spring, whereby the movement of the spring is prevented, while the shank of the trigger remains fixed by the free end of the plate or fap. It consists, further, in constructing the extractors of breech-loading firearms provided with sliding bolts or closers to work in a lengitudinal groove or opening in the rear and upper side of the breech shoe, and operating the extractors by the sliding motions of the breech bolt (acting against shoulders formed on the bodies of the extractors) in opening and closing the breech. It consists, further, of the following mode of securing the hinged blocks of breech-loading firearms during the discharge of the said firearms. A raised piece is affixed to the forward end of the breech shoe into which a bolt takes upon closing the breech block. The bolt in the block works in a longitudinal slot formed in the block, and is released by the pressure of the thrub on opening the breech for reloading the firearm.—Patent completed. sure of the thumb on opening the breech for reloading the firearm.—Patent completed.

frearm.—Patent completed.

2745 W. TATLOCK and C. N. ABELSETH, Chancery-lane.

Gus apparatus. Dated September 5, 1868.

This consists in the peculiar construction of the gas generator through which a continuous current of atmospheric air is forced, all of such air being brought into contact with the liquid with which the generator is charged, and thereby impregnated with the inflammable matter contained in the same. In the centre of a tank is placed a perforated pipe or hollow shaft which, where it passes through the head or end of the tank, is provided with a stuffing box made in the usual way to allow the shaft to revolve freely in the tank without leaking. Upon this shaft, inside the tank; a placed a perforated elydinder, made less in diameter than the tank, to leave a space around it and between it and the tank; outside of this cylinder another cylinder is fitted, which is also perforated, a slight space being left between the two cylinders. This space is filled with cotton batting or other suitable material.—Patent abandoned. -Patent abandoned.

2746 H. COWING, Euston-square. Traction engine. Dated September 7, 1868

September 7, 1868.

The patentee proposes to construct the engine upon a platform or framework to be mounted on two or more wheels of 12ft, or 14ft, in diameter; other wheels, pivoted to separate frames, so as to turn in any direction for steering the apparatus, are also employed. Upon the platform is placed a high pre-sure engine with suitable boiler and furnace, provided with revolving bars and arrangements for feeding the furnace with fuel. The bars, by their motion, clean themselves from clinkers, and by keeping the fuel in slight agitation or motion, prevent the coal from coking. The fire is introduced at the upper part, and the boiler being short, any unevenness in the road or soil will not cause the tubes to be uncovered. The water is to be taken in at bottom, and as it follows a serpentine course, the heat from the fire will be thoroughly taken up and the fuel economized.—Patent abandoned.

2747, J. Woop, New Jersov. Enthem from state. Detail

2747 J. Wood, New Jersey. Railway frog plates. Dated

September 7, 1868.

This consists in making the "froz plates" movab instead of the points or switches.—Patent completed.

Instead of the points or switches.—Patent completed.

2748 C. E. Brooman, Fleet-street. Burning oils. (A communication). Dated September 7, 1868.

This comprises, first, a particular system or mode of feeding burners in lighting apparatus with inheral oils or essences; and, second, a particular system or arrangement of circular burner for the combustion of the oils and essences. The system of feeding the lighting apparatus is based on the capillarity obtained by a main or first conducting wick, extending for any length, and fitted herizontally in a straight or bent tube, on which the burners are placed; the ends or other part of this wick dip into a chamber containing the essence or oil, so that by its capillarity the wick becomes impregnated with it for its whole length. From each burner a vertical wick leads to the main wick, and thereby also becomes impregnated by capillarity with the essence or oil. The keeping at a constant level of the liquid in the chamber into which the ends of the main wick dip is obtained by a reservoir or bottle-like receptacle, with a valve placed over each chamber. The burner employed is preferably circular; it

is composed of several concentric tubes, with an inverted circulation of air; its wick is fixed, and the regulation of the light is effected by a movable glass carrier.—Patent abandoned.

2749 H. M. LEE, Manchester. Visiting cards. Dat 2749 H. M. LEE, Manchester. Visiting cards. Dated September 7, 1868.

The patentee proposes to fit card cases with a chain, so that they can be suspended.—Patent completed.

2750 U. A. MASSELON, Issoudun, France. Burning bricks. Dated September 7, 1868.

The patentee constructs the kiln of a rectangular form with an arched roof with two or more chimneys, and provides two or more furnaces, the doors of which are protected. In the centre of the kiln and at each side thereof tected. In the centre of the kiln and at each side thereof dwarf walls are arranged, running from front to back thereof, such dwarf walls being inclined and slightly higher at the ends remotest from the furnaces. Upon these dwarf walls bricks or other articles are placed to a suitable height. The heated products of combustion circulate and penetrate through and between the mass other articles, and then pass away by suitable flues; spaces are formed in the walls of the kiln, with passages communicating between such spaces and the exterior of the kiln, in order to facilitate the escape of the gases given off in the burning.—Patent completed.

2751 J. JOYNSON, Manchester. Muffs. Dated September 7, 1868.
This consists in constructing "muffs" with projecting ears, gauntlets, or wrist protectors. A hole is also made through which the handle of an umbrella can be inserted. —Patent abandoned.

2752 G. DAVIES, Lincoln's Inn. Water meters. Dated

2732 G. DAVER, Lincoln's Inn. Water meters. Dated September 7, 1868.

This consists mainly of two cylinders, which serve as measures of capacity, and two distributing cylinders, all placed in juxtaposition and parallel to each other, beneath a crank shaft, by means of which the four connecting reds for working the pistons and distributing valves are actuated.—Patent completed.

actuated.—Patent completed.

2753 W.T. CARRINGTON, Westminster. Capstans. Dated September 7, 1868.

The patentee forms upon the barrel of the capstan a series of two or more circular grooves, and combines with the capstan an auxiliary barrel, placed a short distance from the capstan, and having grooves corresponding with those on the capstan. The rope or chain to be hauled in is first acted upon by the capstan, from whence it passes over the first grooves of the auxiliary barrel to the second groove of the capstan, and so on, the slack end being drawn off in the ordinary manner.—Patent completed.

2754 V. WANOSTROCHT, Walbrook, Gunpowder mills

2754 V. WANOSTROCHT, Walbrook. Gunpowder mills. Dated September 7, 1868.

This consists in placing the roofs of gunpowder mills on columns constructed after the manner of telescopes, and in such manner that the roof will easily slide up or down, and so, in case of explosion, instead of being shattered, it will be blown open, and pormit the ready escape of the gases.—Patent abandoned.

2755 A. V. Newron, Chancery-lane. Knitting. Dated September 7, 1868.
The patentee employs a grooved rotating needle cylinder, a needle operating cam, and spring looped needles. The looped end of the needles springs down into a groove in the body under the end. An auxiliary grooved wheel or cylinder is employed to act in conjunction with the cylinder for taking the loop into its grooves.—Patent completed. completed.

2756 E. E. B. J. V. H. STOKES, Birmingham. Pearli ornaments. Dated September 7, 1868. The patentee proposes to utilize pearl in making orna-ments.—Patent abandoned.

2757 J. C. WALKER, Hackney Wick. Washing coppers.
Dated September 5, 1868.
The patentee proposes to employ an inner vessel, into which the articles to be washed are placed. This inner vessel is formed with holes, so that when lifted by handles the water is free to run from it. Slotted perforations are formed near the top, so that a circulation of the water is kept up.—Patent completed.

kept up.—Patent completed.

2758 S. R. TUCKER, Chancery-lane. Rotary engines.
Dated September 7, 1968.
This consists in the novel arrangement of parts for obtaining the continuous action of the steam or other fluid upon the rotating piston or pistons, and other parts in connection of the cylinder and pistons, and other parts in connection therewith; also in the combination of the cylinder and pistons with the main shaft and with a rotating disc or plate, which is fixed on the shaft to carry the pistons. The invention also consists in the peculiar arrangement of the admission and exhaust ports and passages in combination with the disc and pistons.—Patent abandoned.

2759 C. HOLLAND, Chicago, U.S.A. Artificial tiles. Dated

2759 C. HOLLAND, Chicago, U.S.A. Artificial tiles. Dated

2759 C. HOLLAND, Chicago, U.S.A. Artificial tiles. Dated September 7, 1868.

This consists, first, in the intimate combination and cementation of particles of silex, aluminum, calcium, or other mineral substances, singly or admixed in various proportions, by the use of an alkaline solution of gum sheliac; second, in the combination of black or red oxide of iron or of asphaltum, with lime or cement and sand to produce a composition adapted to useful and ornamental purposes as with or without shellac.—Patent completed.

2760 F. Andoe, Swansea. Fire escape. Dated Septem-

ber 8, 1868.

This consists of a box or receptacle for one or more per-This consists of a box or receptacle for one or more persons to stand or place themselves within, and having cords, ropes, or tackle, for suspending it, passed through gripping pulleys or rollers, one pair at either end (or side) of and near to top thereof, and thence by other pulleys or rollers guided, and brought to pass out of the box or receptacle together, or nearly together, at or near to the bottom thereof, and furnished with a check brake for pressing on the tackle or rollers, or some of them, to prevent a too rapid descent.—Patent abandoned.

2761 J. JONES, Durham. Iron furnaces. Dated Septem-

2761 J. JONES, Durham. Iron furnaces. Dated September 8, 1863.

The patentee erects a series of furnaces in advance of each other, constructed with openings on either side, provided with proper doors, so that the pile or slab of iron to be heated can be introduced at one side of the furnace, and then withdrawn from such furnace, at the other side, in a line or thereabouts with the opening of the furnace, into which the slab or piece of iron is to be next introduced.

Between each and beyond the last of the furnaces, rolls are arranged in such a position that the slab or piece of iron is carried directly from the furnaces to the rolls, and then from the rolls to the furnaces, and so on.—Patent completed.

2762 J. BURDETT, Harrow-road. Making bricks. Dated

2762 J. BURDETT, Harrow-rosu. Making with a September 8, 1868.

This consists in making bricks from clay of the required consistency, by forcing it into dies, after which they are separated by cutting wires fitted in a frame; they are then carried on by rollers over another roller, which dips in oil, so that the lower side of the brick is covered with oil; they then pass on the receiving loads.—Patent completed.

2763 A. R. STOCKER and J. A. EDBLEY. Lamb's Conduitairest. Stoppers for bottles. Dated September 8, 1868. Hollow stoppers are composed of sheet metals of exceedingly thin gauge, as will be elastic and springy.—Patent completed.

2764 A. J. Fraser, Holloway. Locks. Dated Septem ber 8, 1868.

This consists in the employment of a ring, and a series of spring bolts, fitted inside the ring, arranged so that the bolt cannot be acted upon by any other than the special key made for it.—Patent completed.

2765 G. LOWRY, Salford. Hackling fibres. Dated Sep-

2765 G. Lowry, Salford. Hacking norm. Dated September 8, 1868.

This consists in the employment of a cam pulley for increasing the number of strokes of the doffing knife. The cam is formed by cutting a suitably shaped groove upon the face of the pulley. The pulley rotates upon a stud or spindle fixed to the side of the machine, and is driven by a strap from a pulley in the machine. A stud or pin that is fixed to the doffing knife is inserted in this groove, when the pulley rotates, the cam rises and lowers the knife two or more times for each revolution of the pulley, according to the shape of the cam.—Patent abandond.

2766 J.Aub, Paris. Spill holders. Dated September 8,

2766 J. Aub, Paris. Spill holders. Dated September 8,

This consists in forming a vase of earthenware, glass, crystal, or any other suitable substance, the form of which is such as to admit of its bearing around its exterior surface, and in its centre, a number of medallions or advertisements so placed that they can be renewed or replaced by others when desired.—Patent abandoned.

2767 P. J. SOULAGE, Paris. Breast pin. Dated Septem-

ber S, 1868.

The pin is constructed of two parts, which when in situ, form a specie of bow, the pin taking the place of the spring, and the point entering an aperture in one end of the bow, prevents its becoming accidentally detached.—Patent abandoned.

2768 E. COTTAM, Battersea. Horse shoes. Dated September 8, 1868.

tember 8, 1868.

This consists, first, in rolling two bars by the same rolls, the two bars when rolled being united. The rolls are formed with raised surfaces and indentations corresponding to the section of iron required for the shoe; second, it consists in preparing horses feet for the reception of the shoes by rasps. The rasps are constructed with an edge flange along one or more of their sides, which enables the shoer to prepare and level the wall of the foot to any desired width, without injuring the sole or frog of the foot—Patent completed.

2769 J. STEWART and J. NICHOLSON, Poplar. Engines

2769 J. STEWART and J. NICHOLSON, Poplar. Engines and raires. Dated September 8, 1868.

Two or more cylinders are so arranged that their pistoms act in unison, the steam acting upon them in the propering direction, until the whole of its useful effect is expended in the production of power and energy. No expension gear is necessary, nor is the steam used twice over, but acts at the same time on each piston, and in the same direction. By the use of a retaining valve between the exhaust and the condenser, or between the exhaust and the atmosphere, according to the form of engine employed, the compression may be regulated to any required degree.—Patent completed.

completed.

2770 S. E. CLARKE, Apsley-cross, Somerset. Fireplaces.
Dated September 8, 1868.

The patentee constructs and arranges the flues of open freplaces in such a manner that the heat, or a portion of the heat, from the burning fuel may be made to heat an oven, and hot plate, and a boiler, so that baking and various cooking and other domestic operations may be carried on simultaneously.—Patent completed.

2771 S. BENJAMIN, Bayswater. Blind for cabs, &c. Dated

September 8, 1868.
This consists of a semicircular blind or glazed sash, which is drawn out from between the roof and false lining of the same inside the cab.—Patent abandoned.

2772 O. WARSOP, Nottingham. Obtaining motire power. Dated September 8, 1863.

This consists of a steam boller and an engine; the engine works an air pump or pumps, drawing in cold air and forcing it through a coll of pipes, or other suitable chamber, heated by a furnace, and from this heated coil or chamber the air passes into the boiler, and is caused to rise in a finely divided state through the water therein. The air and steam together pass from the boiler to work the engine.—Patent completed.

the engine.—Patent completed.

2773 E. Johnson, Brighton. Muffs, cuffs, and collars Dated September 8, 1868.

The patentee proposes to make articles of pheasant feathers, applied in an entirely novel manner. In making a muff, the foundation, or muff proper, is first completed, and the feathers (which are attached by sewing singly or otherwise, to a silk or other backing) are then applied thereon, so as to partially envelope the muff foundation. The feathers are arranged so that they may depend or hang downwards on either side of the muff, meeting at the top (where the smallest feathers are placed) in a seam, which is concealed by a braid or other suitable ormanent. The long feathers are placed at the lower edges of the backing, on either side of the muff, and tend to impart a drooping appearance to the same. When the small or breast feathers only are used they are made to follow the contour of the muff, instead of depending, as before described, on each side.—Patent completed.

2774 J. Milleward, B. Birmingham. Builers. Dated Sen-

2774 J. Millward, Birmingham. Boilers. Dated September 9, 1868.

This consists in providing the upper ends of the heating tubes of vertical boilers with short extension pieces, forming prolongations of the tubes, and rising into the body of the water, above the crown plate of the firebox.



Inner or circulating tubes are provided at the upper ends of the extension pieces, with cloows or branches passing through the sides of the extension tubes, at some distance below the tops of the same, and a little above the tube or crown plate.—Patent completed.

2775 J. ADAMS and H. BARRET, Jersey. 7 Pump. Dated

2775 J. ADAMS and H. BARRET, Jersey, 2 ramp.

2785 J. Roberts of a barrel, furnished with a piston, having a spindlo valve at its lower end. The outer end of the piston rod is provided with an arm, connected to a rod, regulating bar, and hand lever. A pipe from the syrup reservoir is attached to the upper part of the barrel; the flow of the syrup is regulated by a stop cock and valve. The barrel is also provided with a valve, which is kept to its seat by a spring.—Patent completed.

to its seat by a spring.—Fatent completed.

2776 L. B. COVERT, New York. Ladders. Dated September 9, 1868.

The ladder is made with side pieces, grooved on the inner faces; these side pieces are united by cross pieces or steos; the steps may form a single front piece, or may be divided to form front and back portions, so that an extension ladder can slide in the grooved faces and move between the divided steps.—Patent abandoned.

2777 A. M. CLARK, Chancery-lane. Metallic packings. Dated September 9, 1868.

This consists in fitting segment pieces in the packing sockets of engines, and fitting in other pieces connected to springs to press the segments together. The springs are kept close by the ordinary gland bolts which pass through them.—Patent completed.

2778 A.M. CLARK, Chancery-lane. Opening envelopes. Dated September 9, 1868.

A wire is placed inside one edge of the envelope. On pulling either ent of the wire, the edge is severed, when the contents can be removed.—Patent completed.

2779 E. Wood, Bolton. Steam engines. Dated September 9, 1868.

The object of the first part of this is to work the exhaust valves independently, without any intervention or connection with the steam valve gear, by the employment of a second or separate eccentric or eccentrics, cam, or crank second or separate eccentric or eccentrics, cam or crank connecting rods, and wrist plate of the steam valves. The patentee places the condenser immediately under the cylinder. In this arrangement, the air pump has a situation underneath the condenser, being connected thereto by independent passages or thoroughfares, and with the foot and delivery valves of such condenser, which are connected to and placed on one side thereof, the exhaust thoroughfares of the cylinder being connected direct from above with the condenser.—Patent completed,

2780 A. V. Newton, Chancery-lane. Pumps. Dated September 9, 1868.

This consists of a hollow piston, having side openings in it, and double acting disc or puppet valves, carried by the piston and seating alternately, on or over apertures in the ends of the piston.—Patent completed.

2781 J. SHAND, Blackfriars. Boilers. Dated September

10. 1868. The boiler is constructed of an inner shell; the lower part of this shell is open at the bottom, where the firebars are placed. The upper part of the shell contains an arrangement of tubes; it is closed at top, except at the centre, where the chimney or funnel is attached. The shell is surrounded by an outer casing, continued up past the funnel.—Patent completed.

2782 G. Davis, Lincoln's Inn. Embossing horn. Dated

2732 G. Davis, Lincoln's Inn. Embossing horn. Dated September 10, 1868.

The apparatus is composed of a hydraulic pump, body or cylinder fixed in a wooden bench. It is terminated at its upper part by a bridge or spanner, and is closed at its lower part by a cover or valve facing, connected by flunges to the body of the pump. The cover is provided with three oridees or ports, arranged in the same manner as those of a steam engine—Patent completed.

2783 T. Bennett, Birmingham. Spoon and fork machinery. Dated September 10, 1868.

This consists in the employment of suitably shaped dies on rolls, whereby a hollow bead is made along the narrow part of the article, in order to give strength thereto.—Pintent completed.

Patent completed.

2784 A. A. Lejeune. Manchester. Printing fabric.
Dated September 10, 1868.

This consists in combining with the madder colours a certain proportion of a preparation of palm gum commonly called sago or tapicea; the quantity of this palm gum, or sago, or tapicea, depends upon the shade of colour to be printed. In producing red colours, the patentee takes twenty parts of an aluminous mordant, at from 10-leg, to 11-leg, of Beaume's hydrometer, and fifteen parts of the preparation of palm gum, which is to be mixed gradually with the mordant, and headed for from one quarter of an hour, at a temperature of about 53deg, of Beaume's thermometer. The solution must then be passed through a copper sieve and stirred with a hard brush; the solution is then completed by straining it through a cloth.—Patent completed.

2785 E. Padlety, Stafford. Anchors. Dated September 10,

2785 E. PADLEY, Stafford. Anchors. Dated September 10,

The patentee maker the stem or stalk of the anchor active than usual, and provides the stem with the ordinary ring through which the cable is passed. The arms of the anchor are made straighter than usual, and in place of the ordinary thicks at the ends of the arms, he ends are provided with enlargements. The flukes or holding parts of the anchor are arranged on opposite sides of the arms, instead of at the ends of the arms, as is usual.—Patent abandoned.

Patent abandoned.

2786 S. G. Archibald, Edinburgh. Reaping. Dated September 10, 1868.

This consists in machinery for cutting off the ears or heads of the crop. A comb projects downwards to within about 6in. of the ground. The teeth in the combare about 30 in. long and curved downwards, the points of which are sharp, and from 3in. to 4in. apart, but these spaces between them gradually decreases till sufficiently narrow to admit the straw, but not the ears or heads of the grain. Immediately below the comb, where the spaces are narrow, is placed a traversing knife, which cuts off the ears of the grain as they press between the comb. This comb being in front of a receptacle, the machine, by its onward movement merely, not only cuts off the ears, but presses them,

so that they fall over into the receptacle, from which they are gathered up and conveyed to a shed or granary.—Patent abandoned.

2787 W. M. NAUGHT, Rochdale. Furnaces. Dated Sep-

2787 W. M. MAUGHT, Rochdale. Furnaces. Dated September 10, 1868.

The patentee proposes to place the bars lengthways of the furnace; their inner ends are made to slide or move on a crank or rocking shaft, and their outer ends are arranged to move upon a cranked shaft, which leaves the ash pit clear. Motion is given to the rocking or cranked shaft, so as to slide or move all the bars slowly forward towards the fire bridge, carrying the fuel along with them.—Patent abandoned.

2788 J. MAYNES, Manchester. Looms. Dated Sep-

2783 J. MAYNES, Manchester. Looms. Dated September 10, 1863.

This consists in an arrangement of mechanism applied to the loom for changing the shuttles at one and the same end of the slay, namely, the shuttle carrying the broken or exhausted weft leaves the shuttle box, and the fresh weft is supplied to the same shuttle box instantaneously, and without reducing the speed of the loom, the essential advantages to this arrangement being that the outcoming shuttle drives the picker to the extreme or back end of the lathe or shuttle box, so as to be quite out of the way of the incoming shuttle, and this without the necessity of having some special mechanism for the purpose, and the outcoming shuttle is forced out of the shuttle box, without the aid of and quite independent of the picker.—Patent completed.

2789 A. B. IBBOTSON, Sheffield. Railway fastenings. Dated

2789 A. B. IBBOTSON, Sheffield. Railway fastenings. Dated September 10, 1868.

This invention has for its object the fishing or uniting of the ends of railway rails, by the employment of an elastic gripping metal clip which passes underneath the rails. The clip is secured in place by bolts and nuts.—Patent completed.

2790 C. H. J. MATTON, Regent-street. Stockings. Dated 2630 C. H. J. MATION, Acquarements.
September 10, 1863.
The papers connected with this invention are still with the law officers.—Patent abandoned.

2791 S. TRAGHEIM, Gray'S Inn-road. Cleansing fibres. Dated September 10, 1868.

The papers connected with this invention are still with the law officers.—Patent abandoned.

Dated September 10, 1822.

The papers connected with this invention are still with the law officers.—Patent abandoned.

2792 J. Challender, and P. B. Kitchin, Manchester. Fitting fog signals on rails. Dated September 10, 1863.

This consists in securing a vertical or inclined grooved channel, race, or slide to any convenient portion of the brake or guard's van that will form the terminal to a train beyond the himd wheels. The inclined slide is constructed so as to receive a fog or detonating signal, which, when placed in the orifice, at the top of the slide in the guard's van and released, will slide or pass downwards to the lower extremity of the groove, which is provided with a stop or hinge formed on the front portion or arm of a bell crank lever, which, when in its normal position, remains flush, or in a line with the slide, forming thereby a receiver for the signal, the space in front being open, so as to allow of the free movement or action of the lever. The opposite end of the bell crank lever is connected by a rod running parallel with the slide, with a handle in or on the guard's van, that forms the medium through which motion is given to the lever, and to the stop or finger holding or retaining the detonating signal; the fulcrum or centre upon which the retaining lever turns, admits of a slight lateral movement of such lever by means of a grooved wheel that comes into contact with the metals, and prevents the vibration or unsteadiness of the carriages, when running, from interfering with the true and respective position of the rail and signals relative to each other. The detonating signal is provided with spring clips or fasteners, which, when forced upon the rail, firmly close upon the upper flange of the metals, by which means such signals become permanently secured thereto, until exploded by the passage of a train over them.—Patent completed.

2793 J. Oliver and C. O. M'Allum, Newcastle-upon-Tyne. Utilizing alkaline salits.

2793 J. J. OLIVER and C.O. M'ALLUM, Newcastle-upon Utilizing alkaline salts. Dated September 10

The patentees state that if the soda mother liquors contain a large excess of chloride of sodium, they prefer to utilize the alkaline and neutral salts present as follows:

—They decompose the carbonate of soda present in the ash with sulphate of magnesia, in order to obtain hydrated carbonate of magnesia, precipitated, and sulphate of soda, in solution. A slight excess of carbonate of soda is employed, to insure the complete decomposition of the sulphate of magnesia, and to effect this, with some degree of certainty, they use hot solutions of carbonate of soda and sulphate of magnesia, at a temperature ranging from 160 leg. to 180deg. Fab. The soluble salts are separated from the insoluble carbonate of magnesia by the ordinary process of filtration; the supernatent liquor, containing the neutral saline salts, is evaporated to dryness, and treated with an equivalent quantity of sulphuric acid, to decompose the chloride of sodium present.—Patent completed.

2794 A. CRULE, Brussels. Pressing fuel. Dated Sep-The patentees state that if the soda mother liquor

2794 A. CRULE, Brussels. Pressing fuel. Dated September 10, 1863.

tember 10, 1868.
This consists in certain combinations of mechanism whereby pressure such as is required in various branches of manufacture, can be obtained in a simple and effectual manner. The frame of the machine consists of two upright portions, the top being semicircular, and pierced with a screw-threaded opening through which the main screw passes. Motion is given to the latter by a horizontal flywheel placed at its upper extremity, the same having several handles projecting downwards attached to it. The flywheel acts upon a smaller concentric wheel on which are one or more cams, which cams, when brought in contact with similar cams formed on the screw head, produce, by the action of a larger flywheel, a succession of shocks, giving a greater amount of pressure than can be obtained by a continuous action. The main screw is single threaded, the lower portion thereof being square, and passing through a socket which acts as a guide, and is held in position by two crosspieces. The bottom of the main screw is flyed to the compresser. At each corner of the bed of the press is a hole, through which holes small upright movable columns pass. The columns rest upon a crosspiece and carry the mould. A screw, to which motion is given by a small flywheel, raises the mould to allow the block of fuel or other article to be withdrawn, or lowers it, to be filled with fresh material. The mould may be divided into several compartments.—Patent completed. This consists in certain combinations of mechanism

2795 W. R. LAKE, Chancery-lane. Condensing apparatus Dated September 10, 1868.

This consists in the employment of a syphon, the long leg of which forms a waste pipe, and the short leg an injection pipe. Several long legs may be employed of aggregate capacity to that of the injection pipe. A pump may also be used to raise the injection water from the well. The condenser may be partitioned, so that the injection water is brought in direct contact with the steam, in order to heat it sufficiently before heing fed into the order to heat it sufficiently before being fed into the boiler .- Patent completed.

2796 A. C. HENDERSON, Charing Cross. Shoe straps or springs. Dated September 10, 1868.

This consists in making the side springs of boots of different coloured materials, that is to say, red inside and black outside, in order to distinguish the make of goods.

Patent completed.

2797 O. C. EVANS, Lambeth. Girders. Dated Septemer 11, 1868.

2797 O. C. EVANS, Lambeth. Girders. Dated September 11, 1868.

The patentee states that the invention consists, first, in forming and uniting in a chain alternately a square or oblong, with two half or connecting links (which are hook links) made of round, square, or flat bar metal. A hook, at each end of each half link, is formed at right angles with the bar, in such manner that, when inserted from underneath the end bar of the open link, and the hook from the inside will rest on the side bar of the open link, and the end bar of the open link on the bar of the half link, if both are brought within the same curve or plane.—Patent abandoned.

2798 B. Dobson, Bolton, Wood cutting, Dated Septem-

2798 B. DOBSON, HOILOR. Wood cutting. Dated September 11, 1868.

This consists of a combination and arrangement of machinery for effecting the various operations required to saw, plane, and sand-paper mule carrriages, and other articles, which operations can be performed, either separately or successively, and simultaneously, in the same machine.—Patent completed.

and simultaneously, in the same machine.—Patent completed.

2799 W. Thompson, Dublin. Sifting, cutting, and mixing tea. Dated September 11, 1868.
Upon the top of the framing of the tea mixing apparatus is fixed the tea cutting apparatus, composed of a horizontal cylindrical casing made slightly tapering towards one end, in which is fitted a rotating drum of a corresponding apering form, carried by a central spindle which passes through the casing, and is provided at one end either with a crank handle. On the surface of the drum are fixed or formed a number of cutting edges or blades running along the whole length of the drum, and on the sides of the casing are fixed or formed other cutting edges or blades, also running the entire length of the casing, which latter blades are, by preference, secured in a removable manner by means of screws to lugs on the outside of the casing, and are made to pass through slits formed on the latter, so as to be readily removable when requiring to be sharpened; they may, however, also be formed or fixed permanently on the inner surface of the casing.—Patent abandoned. abandoned.

abandoned.

2800 B. D. Godfrey, Chancery-lane. Securing soles on boots. Dated September 11, 1863.

The patentee employs sprigs, which are formed with screw threads, but which, instead of being inserted by turning or screwing them in, are driven into the sole, like an ordinary nail or peg, two or more threads being formed on the sprig, to give the screw a quick pitch, so that the act of driving in the sprigs causes their rotation in the leather.—Patent abandoned.

leather.—Patent abandoned.

2801 J. Hudden, Stockport. Filtering casks. Dated September 11, 1868.

This consists in supporting the barrel on a swivel stand, and connecting the hind portion of the barrel, by means of a hook and chain, to a quadrant, secured to or forming the end of a lever, which is supported on a shaft, rod, or pivot, that forms the fulcrum of such lever, the projecting end, on the opposite side of the fulcrum, being supplied with an adjustable counterpoise.—Patent abandoned.

with an adjustable counterpoise.—Patent abandoned.

2802 J. Bullough, Lancaster. Warping machines.
Dated September 11, 1863.
This consists in a certain mechanical arrangement
whereby a warper is relieved from the necessity of turning the yarn beam by hand, to take up the slack or
overun of the bobbins, before starting the machine after
a stoppage. At the end of the warp drum shaft there is
a friction motion or clutch box, which is brought into
gear by the pressure of the warper's foot on a treddle,
running along the front of the cylinder and near to the
floor. This treddle is held by two arms, one at each side
of the drum, which are fastened to a rod, each end of
which rests in a bearing fixed to each side of the machine.
The machine having stopped, the swing or drop rollers
descends and takes up the overun of the bobbins.—Patent
abandoned.

2803 E. T. HUGHES, Chancery-lane. Annealing wire. Dated September 11, 1868.

This relates to annealing gauze wire used in the manufacture of paper, and consists in causing the wire to pass over a heated cylinder, by which means it is more evenly and thoroughy annealed.—Patent completed.

# APPLICATIONS FOR LETTERS PATENT.

PATENT.

Dated March 15, 1869.

785 J. Henderson and T. Brown, Kirkcaldy, Fifeshire. Improvements in the construction of water cocks or valves.

786 W. A. Martin. Union-street. Southwark, Surrey. New or improved apparatus for diffusing the heat and promoting the generation of steam in steam boilers.

787 E. Sands, Manchester. A new mode of producing motive power by continuous rotary motion.

788 J. C. Shaw, Patricroft, near Manchester. An improved traverse card grinder.

789 C. D. Abel, Southampton-buildings, Chancery-lane. Improvements in healds and heald frames for weaving, and in the manufacture of the said healds.

790 H. D. Rawlings, Nassau-street, Portland-place. Improvements in apparatus employed in filling bottles or other receivers with aerated liquids.

791 J. G. Jennings, l'alace-road, Lambeth. Improvements in apparatus for preparing sewage for irrigating land.



792 G. P. Evelyn, Army and Navy Club, Pall Mall. Improvements in the construction of the sails, yards, and rigging of ships or vessels.
793 J. R. Cooper, Birmingham, Improvements in

rigging of ships or vessels.
793 J. R. Cooper, Birmingham. Improvements in breech-loading firearms.
794 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in steam vessels for ocean and river navigation.
795 W. R. Lake, Southampton-buildings, Chancery-lane. An improved multiple drilling machine.
Dated March 16, 1869.
796 J. Taylor, R. and J. Ingram, and J. Sharplis, Crawshaw Booth, Lancashire. Improvements in carding engines of the class in which the doffing cylinder is divided into spaces, and a novel method of testing and utilizing the slivers from the same.
797 W. A. Lyttle, The Grove, Hammersmith. Improvements in the means and apparatus employed for sustaining and insulating electro-telegraphic overland line wires.
798 W. M'Adam and S. Schuman, Glasgow. Improvements in the means and other frangible articles.
799 O. Whittaker and H. and I. Wallwork, Hurst, near Ashton-under-Line. Improvements in the construction of saddles and hangers and top and bottom bearings for shafting, and rollers used in connection with machinery for preparing and spinning cotton and other fibrous substances.
800 F. Render, Manchester. Improvements applicable

800 F. Render, Manchester. Improvements applicable the transport of minerals and other merchandize upon

railways.
801 W. Campion, Nottingham. Improvements in sew

ing 1. machines.

2 W. Robertson, Queen's Chambers, Market-street, nehester. Improvements in self-acting mules and Manchester.

Manchester. Improvements in self-acting mules and twiners.

803 L. Engel, Mumford-court, Milk-street, City. Improvements in umbrellas, sunshades, and parasols.

804 J. L. Norton, Belle Sauvage-yard, Ludgate-hill, City. Improvements in looms for weaving.

805 W. and C. S. Catt, Ipswich. Improvements in the joints of carriage shafts, and in connecting splinter bars to carriages.

joints of carriage shatts, and in connecting spinion base to carriages.

806 E. Roper, Garrick-street, Middlesex, and G. Shaw, Penkhull, New-road, Stoke-upon-Trent. Improvements in the production or preparation of printing blocks, plates, and cylinders, with surfaces in relief and intaglio.

and cylinders, with surfaces in relief and intaglio.

Dated March 17, 1869.

807 J. James, Princes-street, Stamford-street, Lambeth. Improved apparatus for compressing powders into pellets. 808 E. W. P. Gibbs, Westbourne Park-orescent, Harrow-road, Paddington. The improvement in the method of propulsion of vehicles commonly denominated velocipedes, by the application of levers of unequal arms, acting on cranks fixed in the axle of the rear wheel or wheels, and on a fixed or movable fulcrum.

809 B. Latham, Westminster Chambers, Victoria-street. Improvements in the means and machinery or appliances for filtering and straining liquids, especially applicable for straining sewage.

for straining sewage.

810 T. Rickett, Birmingham. Improvements in velocipedes and other wheel vehicles.

811 J. J. G. Damitte, J. M. Agnellett, and H. D. Dubois, Paris. Improvements in the manufacture of pulp.

812 H. Claughton, Dumbarton. Improvements in screw propellers.

812 H. Claughton, Dumbarton. Improvements in screw propellers.
813 J. Heywood and J. Wild, Tonge, Lancashire, and F. Murphy, Middleton, Lancashire. Improved tapes for renetian window blinds, for ribbons, hatbands, and similar articles, and for improved looms and apparatus for weaving them.
814 M. Rourke, Manchester. Improved combinations of textile fabrics and paper (for oil and tar cloths, floor cloths, tarpauling, table-covers, and similar articles, and the mode of manufacturing the same.
815 J. Carter, Nottingham. The manufacture or production of chemical night soil closets, and for other similar purposes.

duction of chemical night soil closets, and for other similar purposes.

816 H. Starr, Moorgate-street, City. {An improved safety hook for harness and other purposes.

817 F. Gillham, Liverpool. Improvements applicable to hats and other like coverings for the head.

818 J. H. Bennett, Leith, Mid Lothian. Improvements in steam engines and boilers.

819 C. F. Claus, Middlesbro-on-Tees. Improvements in the manufacture of carbonate of potash and the recovery of certain products evolved therein.

of certain products evolved therein.

Dated March 18, 1869.

\$20 J. Ramsbottom, Crewe, Chester. An improved mode of ventilating railway tunnels.

\$21 T. Martin, Seafield House, Formby, Lancashire. Improvements in the means for supplying ammunition and other objects to troops under action, and in cars or vehicles employed for that purpose, also improvements in such ammunition and in the mode of packing the same.

\$22 G. R. Mather, Wellinborough, Northamptonshire. Improvements in means or apparatus for cutting or giving form to wood.

-823 J. C. Ramsden, Bradford, Timprovements in looms rweaving.

167m to woon.

- 823 J. C. Ramsden, Bradford T Improvements in 160ms rweaving.

824 E. Booth, W. P. Gaultou, and J. Walls, Ashton Oldroad Iron Works, Manchester. Improvements in mechanism or apparatus for regulating the admission of air to steam boiler and other furnaces arranged for consuming smoke and economizing fuel.

825 J. H. Johnson, Lincoln's Inn-fields. Improvements n firearms and ordnance, and in curtridges to be used therewith, which cartridges are also applicable to other firearms, to the exploding of destructive engines of warfare, and for use in mines.

826 J. T. Darke, Oatlands Park, Walton-on-Thames, Surrey. Treating sewage, and the manufacture of manure therefrom.

therefrom. 827 A. de Pindray, Boulevart St. Martin, Paris. An improved smoke consuming apparatus for steam gene

improved smoke consuming apparatus for steam generators and other purposes.

828 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in anchors.

829 S. Haycraft, Rirmingham, and A. and S. Haycraft, Stroud, Gloucestershire. Improvements in stationary, ocomotive, and marine steam engines.

830 J. Partington, jun, Oidham. An improved smoke consuming apparatus.

831 W. T. Sugg, Vincent Works, Vincent-street, Westminster. Improvements in gas burners, and in the method of constructing and manufacturing the same.

832 A. B. Walker, Liverpool. Improvements in apparatus for producing and for applying heated air to various useful purposes.

833 J. Ritchie, Leicester-street, Leicester-square, West-minster. Improvements in flywheels and other construc-tions, rendering the same heavy or light as may be re-quired.

834 J. Cox. Gorgie Mills. Edinburgh. Improvements in

s34 J. Cox, Gorgie Mills, Edinburgh. Improvements in velocipedes and modes of propulsion.

Dated March 19, 1869.

835 E. A. Ingleßeld, Grove End-road, St. John's Wood. Improvements in steering apparatus worked by hydrostatic pressure.

836 J. Thomas, Middlesbrough-on-Teos, W. Bacon, New-castle-on-Tyne, and H. Groves, Redcar, Yorkshire. Improvements in the manufacture of iron and steel, and in furnaces and apparatus employed therein.

837 F. W. Fox, Atlas Iron Works, Bristol. Improvements in locomotive engines and carriages for railways.

838 A. Albini, New Broad Street-buildings, City. Improvements in repeating or revolving firearms.

839 C. G. Bonehill, Birmingham. Improvements in breech-loadling firearms.

840 J. Jack, Liverpool. Improvements in the construction of ships to adapt them for auxiliary screw propellers.

841 E. T. Hughes, Chancery-lane. Improvements in weighing scales.

cooling, withdrawing, and conveying fermentable and aerated beverages.

848 F. D. Nuttall, Lancashire. Improvements in or applicable to reverberatory furnaces.

849 J. D. Morrison, Grange-road, Edinburgh. Improvements in heating and ventilating buildings and ships by apparatus for warming, circulating, and purifying air and water, and for employing the same as sanitary agents.

850 H. Whitehouse, Tipton, Staffordshire, and W. Probert, Worcestershire. Improvements in tuyeres for blast furnaces, forges, and for other furnaces.

851 F. Holmes, Hatcham-road, Surrey. Improvements in pulley arrangements applicable to blind cords and other purposes.

in pulley arrangements applicable to blind cords and other purposes.

\$52 W. L. Wrey, United Service Institution, Westminster. Improvements in toothed gearing.

\$53 W. J. Robinson, Dublin. Improvements in the production of negatives applicable for photographic printing, and for obtaining raised printing surfaces.

\$54 F. E. Duckham, Millwall. Improvements in governors for marine engines.

\$55 J. Kay, Glasgow. Improvements in the mouthpiece of wind instruments.

\$56 H. E. Newton, Chancery-lane. Improvements in apparatus for measuring liquids.

\$57 H. E. Newton, Chancery-lane. Improvements in motive power engines.

Dated March 22, 1869.

Dated March 22, 1869.

motive power engines.

Dated March 22, 1869.

858 W. H. Philips, Nunhead, Surrey. Improvements in apparatus for containing and discharging water or other fluid for extinguishing fires and for other purposes.

859 W. R. Lake, Southampton-buildings, Chancerylane. An improved hay-tedding machine.

860 J. Booth, Birmingham. Improvements in the indexes of account books and other books.

861 J. Loader, Upper Clifton-street, Worship-square. Improvements in means or apparatus for injecting water into steam bollers.

862 G. Lauder and G. Cope, Liverpool. An improved machine for twisting or spinning tobacco.

863 T. Carrodus, Keighley, Yorkshire. A new or improved self-coupler for railway engines, carriages, and waggons, or other purposes requiring similar couplings.

864 W. G. Crossley, Cambridge. improvements in the construction of wheels.

865 W. Crossley, and J. W. Swithenbank, Bradford, Improvements in shuttles.

866 E. G. Reuss, Sheffield. Improvements in the manufacture of table cutlery.

867 H. Vansittart, Richmond, Surrey. Improvements in the construction of screw propellers.

# LIST OF SEALED PATENTS. Scaled March 19, 1869.

Scaled Mar 2080 J. M. Hunter 2002 C. Wheeler 2921 E. W. Halliday 2922 H. Lomax 2924 A. Barclay 2925 J. H. Glow 2927 C. Heptonstall 2020 A. M.N. and M. A. Weir 2930 H. Woods 2031 C. Hengst, H. Wat-son, J. B. Mus-champ, and N. Wil-2934 E. Death and J. Ell-wood 2936 J. Fry 2938 J. F. Wanner 2953 H. Davey 2955 J. Sutcliffe 2972 R. Duncan 2994 A. Lafargue 3039 C. F. Galand and A. Sommerville 3310 Q. and J. Whyte 3600 J. Grindrod 3831 F. Ryland 2934 E. Death and J. Ellson, J. B. Mus-champ, and N. Wil-

### Sealed March 23, 1869,

Sealed Mar
2941 J. Torbitt
2944 J. Wright and W. H.
Williams
2952 P. J. E. Caron
2954 J. H. Johnson
2959 P. Spence
2960 J. Petrie
2961 J. Jones and G. E.
Wilkinson
2962 G. F. Morant
2963 V. Gallet
2964 H. Gibson
2965 F. B. Doring
2969 W. M'Adam
2971 G. A. C. Bremme
2973 J. Rabinson
2975 J. Smith
2978 A. M. Clark
2988 A. V. Newton h 23, 1869.

3008 J. D. Scally
3018 F. A. Calvert
3029 Z. Shrimpton
3048 T. Garnett
3055 J. H. Johnson
3056 D. Marshall
3094 H. A. Bonneville
3101 H. A. Archereau
3110 G. P. Grant
3141 L. Clozel
3190 A. Clark
3194 W. R. Lake
3211 J. H. Johnson
3215 T. Forster and J.
Heartfield
3403 H. L. Bennison
3497 A. Clark
285 A. M. Clark

# NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Ga
3405 T. Rose and R. E.
Gibson
3408 G. Clark
3411 J. H. Wilson
3419 H. Bessemer
3427 F. Holmes
3428 S. and G. Holt
3435 T. B. Collingwood
and W. Hardman
3436 P. J. Livesey
3441 J. Kellow
3445 W. Thomas
3447 J. Dendy and J. H.
W. Biggs
3451 C. Markham and W.
Knighton
3454 B. A. Gold
3462 P. Hill
3464 R. Beckley and J. J.
Hicks
3467 W. Richardson From the "London Gazette," March 23, 1869, ette," March 23, 1869.

3575 E. R. Wethered

3579 E. Lakin and W. H.

Rhodes

3581 G. Bernhardt

2496 W. R. Lake

3597 D. Vogl

3663 J. L. Norton

3664 J. Tidmarsh

3675 D. Dorrity

3707 A. V. Newton

3715 A. B. Berard

3745 W. Baines

3766 J. Pickles, E. Ramabottom, S. Haggas, S. Foulda, J.

Shackleton, and W.

Berry gas, S. Founds, J.
Shackleton, and W.
Berry
3789 J. Hine
3829 J. Worrall and J.
Kerahaw
3830 T. Aveling
173 C. Baunscheidt
225 C. B. Parkinson, A.
and J. Metcalfe and
W. H. Heald
327 J. Macintosh
369 J. S. Offord
598 G. J. Hinde
602 J. Reap and W. H.
Michelmore
602 J. Reap and W. H.
Michelmore
604 W. A. Herring
612 T. S. Blair
625 W. R. Lake
630 B. C. Crawford]
632 J. G. Willans
640 W. Clark
660 T. Greenwood
724 J. Henderson
752 T. Greenwood Hicks 3467 W. Richardson 3476 J. Smith 3479 P. J. Ravel 3479 P. J. Ravel
3484 A. M'Niell and W.
Wheaton
3485 R. M. Boniwell
3493 J. E. H. Harris and
T. Lumley
5503 C. E. Brooman
3506 A. M'Dougall
3508 B. Bell
3514 W. Thompson
3524 J. D. Hopkins
3526 A. Guthrie
3534 B. and B. T. Newnham
3571 T. Prideaux
3573 H. E. Newton

# PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

HAS BEE
779 T. G. Ghislin
780 W. Hutchinson and
F. Jolly
785 W. and F. Bates
815 H. B. Barlow
830 F. P. Warren
935 J. J. Derriey
837 C. Roziere

853 W. Clark 859 C. E. Brooman 861 W. L. and T. Winans 863 J. Erskine 907 T. Storey and W. V. Wilson 1167 A. Bognet

# PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

723 G. Hamilton 744 T. Myers 753 W. Tongue 765 R. Wilson

785 J. Newall 836 R. Boby 841 W. L. Winans

### OF SPECIFICATIONS PUBLISHED For the week ending March 20, 1869.

No.	Pr.	Νo.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No,	Pr.
2390 2405	0 8 0 8		1 10 0 10 0 8	2481 2482 2483 2484 2484	0 4 0 10 0 4	2496 2497 2498 2499 2500	0 6 0 4 0 4	2519 2521 2522 2522 2523 2524	0 4 0 4 0 4	2536 2537 2538 2541 2544	0 4
2414 2422 2424 2426 2432 2439 2448 2455 2457	2 6 1 4 1 4 0 6 1 8 2 0	2467 2469 2471 2472 2473 2474 2476 2478 2480	1 0 0 6 0 10 0 8 0 8 1 6	2486 2487 2488 2490 2491 2492 2493 2494 2494	0 4 1 4 0 4 0 4 0 4 0 4	2502 2503 2504 2506 2507 2511 2515 2516 2517	1 8 0 4 1 4 0 6 0 4 0 4	2526 2527 2529 2530 2531 2532 2533 2534 2585	0 4 0 4 0 10 0 4 0 8 1 0	2546 2549 2556 2579 2585 2582 2588 2589 2660	0 10 0 4 0 4 0 8 0 8 0 4 0 4

NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be such, payable to ROBERISON, BROOMAN, and CO., Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

# PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the following numbers:—

3478	631	672	683	697	709	724	788
3616	634	678	684	698	710	726	740
3961	653	674	685	699	711	728	748
67	657	675	686	700	712	729	744
225	659	676	687	701	714	730	746
319	661	677	688	702	715	731	748
379	663	678	689	703	716	732	750
468	665	679	691	704	718	784	752
592	667	680	692	706	719	735	754
594	668	681	691	707	720	736	756
607	671	682	695	708	722	737	758
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THE

# MECHANICS' MAGAZINE.

LONDON: FRIDAY, APRIL 2, 1869.

# INSTITUTION OF NAVAL ARCHITECTS.

THE first paper read at the meetings of this Institution, was one by Mr. William Institution, was one by Mr. William Fairbairn, "On the Law of Resistance of Armour Plates." As early as the year 1835, Mr. Fairbairn had satisfied himself that iron was the proper material for the construction of ships, not only for the merchant service but also for the navy. In accordance with this conclusion, Mr. Fairbairn endeavoured to impress upon the Government of that day the necessity of building iron men-of-war, and offered his services in the superintendence of experiments to determine the effect of shot upon targets built to represent the sides of iron ships. The Government, however, fought shy of the new material, and limited its use to vessels built for the mail and packet service. Targets were built, and experiments conducted in the presence of the Lords of the Admiralty, from which the authorities at Whitehall concluded that iron was not a suitable material for the construction of vessels as ships of war. For twenty years, the Admiralty remained deaf to the calls of the Admirately remained dear to the cans of iron, until armour plates were suggested by the Emperor of the French, as a means of defence for ships of war. This led to the building of "La Gloire." The English followed suit with the "Warrior" and "Black Prince." Soon after this time, the Iron Plate Committee was appointed, and for several years there was a constant series of experiments to test the rival powers of guns and plates. In a few years, the 41-inch plates had added to their thickness an additional 10 in. of solid iron, while the guns had grown from 68-pounders to 600-pounders, and who knows but that they will still grow, and that we may ere long be deafened with "the roar of a 40,000-pounder."

While these experiments were being carried on, it was thought advisable that a second series of experiments on the same plates should be conducted. They were subjected to statical pressure, with a view to determine the law of resistance, and to establish formulæ for the guidance of the artillerist and the engineer. Experiments were made on the shearing, tension, and compression of three iron plates and one steel. The result showed that the tenacity, as indicated by the ultimate elongation, increased directly with the increase in the thickness of the plate. The compression did not change appreciably with the thickness. With regard to the third and more important point, the regard to the third and more important point, the riper and purposing a papelogy was point, shearing and punching, an analogy was supposed to exist between the resistance of iron plates to shot, and their resistance to statical pressure. It was desired to ascertain the law of the resistance to punching. These experiments fully established the fact that the resistance of armour plates to punching varies directly as the product of the diameter of the directly as the product of the diameter of the punch and the thickness of the plate, or the depth of penetration, and this regardless of the form of the punch. The indentation, how-ever, of a round-ended punch, was more than three times as great as that of a flat-ended one; hence we deduce that the work expended in punching with a flat-ended punch is very much less than with a round. This is a point well worthy of attention, though, of course, it must not be assumed, without trial, that the metal in the neighbourhood of the punched hole is equally strong in both cases. In applying the formulæ deduced from these

conclusion that the action of the shot is approximately the same as that of the punch. A large part, however, of the work accumulated in a shot is wasted, through the breaking up of the shot itself. Even with hard flat-ended steel shot, which are very effective for perforation, more than half the accumulated work is lost or expended uselessly. This waste Mr. Fairbairn puts down to one or more of the following causes:-1, distortion of the shot; 2, the size of the perforation being much greater than that of the shot; 3, injuries to the plate other than per-foration; 4, the oscillation or recoil of the plate when struck; 5, want of directness of impact. The work expended in these ways need not necessarily be wasted. Its expen-diture in these ways only lessens the balance upon which we may draw for the mere per-foration of the plate. Mr. Fairbairn hopes in another year to be able to give the result of a course of experiments on the relative power of resistance to perforation of solid plates, and plates built up of several thick-

The next two papers were both on the same subject, "Floating Docks;" the first was read by Mr. George B. Rennie, and the second by Mr. Charles H. Wigram.

Mr. Rennie's paper consisted of a description and a calculation of the stability of the iron floating dock at Carthagena. It is a huge rectangular box, without top or ends, the walls and bottom being hellow and the walls and bottom being hollow and divided into chambers. The vessel to be divided into chambers. docked is run in at one of the open ends, the hollow chambers are then emptied, and the vessel is thus raised high and dry out of the water. The vessel is shored in the manner usually adopted in an ordinary graving dock. A Spanish frigate drawing 27 t. of water has been raised by this dock, and the ironclad "Numancia," of 5,600 tons weight, remained supported in the dock for eighty days, without any damage either to the ship or the dock. With this ironclad on board, the dock drew 111ft. of water. Mr. Rennie advocated the rectangular form of floating dock in preference to the U-shaped docks, like the one which has been built for Bermuda. The advantages are simplicity of construction, small amount of material for required strength, smallness of cost, simplicity of working, and safety. Its chief disadvantage is that the rectangular form is not at all suitable for a voyage, but, nevertheless, docks of this shape have been towed for great distances. A noteworthy example is the Alexandria dock, which was A noteworthy built in the south of France.

Mr. Wigram's paper was a short one on a dock which had been proposed for the Austrian Government. It was designed to dock the unfortunate ship the "Radetzki" (lately blown up), which was of 174ft. draught. The accommodation at the Austrian ports in the Adriatic is not equal to the requirements of a vessel of this size. The "Radetzki" was to be docked in deep water, and then, after pumping out the water from the chambers, the dock and vessel were to be run into shallower water alongside the arsenal. Here is an instance of a case where a floating dock is not only useful but absolutely necessary. At Bermuda, too, where the rock is so porous that it is impossible to make water-tight masonry, a dock of this kind, if any, must be resorted to. Though not so any, must be resorted to. sanguine as some of the gentlemen who spoke on this subject, and who thought that, before long, every fleet would be accompanied by its floating dock, we yet regard with favour a method of supplying docks to ports which must otherwise have been dockless, and, in many cases, of saving great expense in masonry.

Iron Works, Chelsea. It is by Mr. Woolner, the well-known artist, to whom too great praise cannot be given for the masterly manner in which he has treated the subject. He has represented Lord Palmerston in the act of addressing the House of Commons, and has succeeded in enduing the figure with a life-like energy of expression and dignity. The statue is intended to be placed in Palaceyard; it is 7ft. in height, and contains about 25cwt. of bronze metal. Of this quantity nearly 10cwt. was obtained from the statue of Sir Robert Peel, which has lately been removed from Palace-yard and broken up. The mould was commenced in January last, and the term of the contract expires with the present month. The metal was run on the 1th ult., and the statue is now on the eve of completion. It is certainly a faithful and masterly representation of the illustrious

The inspection of this casting affords us an opportunity to say a few words upon the subject of statue founding generally. In the first place, it is a great compliment to the Messrs. Holbrook, for unless a firm has successfully carried out some of these large works of art they have little or no chance of obtaining the contract from the sculptor. And this is very reasonable, inasmuch as the And this is very reasonable, masmuch as the whole success of a sculptor may depend on his first figure being well and faithfully carried out according to his design. One bad cast may seriously injure an artist's reputation. For this reason, artists are particularly correct to send their works to the ticularly careful to send their works to the firms best known, and thus it has happened that there has always been a tendency for this special branch of business to fall in a few hands only. Hence, Messrs. Elkington, of Birmingham, have lately held the highest reputation, and have done a very large business with but little fear of competition. There is, however, a great disadvantage in having these castings made out of London, where the leading sculptors are located. The cast has always to be chased before it can be presented the public, and this must always be done under the supervision of the sculptor. When the cast is made in London, the inconvenience of sending the figure back to the artist's studio is avoided.

We will now describe generally the method of procedure, by which the cast is produced. The first point is to form the box or cast-iron framework, in which the cast is to be made. The sides and ends are, for a figure such as Lord Palmerston's, about 11 in. thick, and these are braced across by diaphragm plates, to prevent any springing. Into this bed the figure is laid, and, to prevent any movement, ordinary moulding sand is rammed tightly round it up to the edge of the box. The edge of the box is as nearly as possible the greatest diameter of the figure. To the portion ex-posed above the box, plastic clay loam is applied. The art of the moulder is required to arrange his clay, so that he may be able to remove it from the figure. To this end, he arranges the clay in separate bricks (so to speak), and when the model is removed, he builds these up together again. As the shape of each piece of clay is formed by its own pressure against its neighbour, the pieces fit exactly. Each piece of clay being applied, red hot irons are laid on it to force it into its position, and to prevent it cementing with its neighbour.

A second frame is then placed over the figure on the top of the lower one, and sand is rammed in to prevent any movement. The whole mass is then turned over. The first box, which is now at the top, is taken off, and clay applied as before. After the whole figure has been prepared in this way, and the core is formed and placed in its position, the the metal in the neighbourhood of the punched hole is equally strong in both cases.

In applying the formulæ deduced from these experiments to the results of experiments at Shoeburyness, Mr. Fairbairn comes to the Messrs. Holbrook and Co., of the Manor poured in, the steam given off has driven the molten metal up the channels, and a frightful catastrophe has been the result. Much of the success of the cast depends on the metal being run in at the same tempera-ture throughout the figure. To insure this, a large tank is formed above the boxes, with plugs attached to a lever. On the lever being raised, the metal rushes down into the mould, and the cast is the work of a few seconds only. The thickness of metal in the statue of Lord Palmerston is about 3-8ths of an inch. The number of inlets for the metal to enter

the moulds was fifty-two.

One of the chief difficulties in statue casting is the necessity for making the cast in one piece. It is not, however, unusual to cast these figures in separate pieces, but then the delicacy of the artist's touch is lost in the separate manipulation of the parts, and the result frequently is that the reproduction, after a brief existence, is consigned to the hammer. Another cause of failure often is the want of adequate lifting power. to the size and weight of the mould enclosed in its iron framework (stayed and braced to prevent the slightest displacement while the prevent the slightest displacement while the mould is being formed), great lifting power is always necessary. The mould of the Palmerston statue weighed about 11 tons. Every facility for producing a successful result is found in the foundry department at Messrs. Holbrook's works. The building is spanned by two large wrought-iron travellers, each capable of carrying 20 tons; and with these and other convenient appliances at his disposal, the contractor can confidently at his disposal, the contractor can confidently anticipate successful results. A colossal figure, for the Canadian colonies, to be cast in Florentine bronze, is rapidly approaching completion at Messrs. Holbrook's works, and we hope in a few weeks to record its successful casting. The artist in this case is Mr. Wood.

# PRESERVED MEAT.

DR. LETHEBY, in opening his fourth Cantor Lecture on food, delivered before the Society of Arts at the close of last year, observes:—"It requires no argument to show that the preservation of food is a matter of great public importance; for it not only enables us to provide against actual want in periods of unusual scarcity, but it also affords the means of equalizing the dis-tribution of food at all times, so that the excess of one country may be used in supply-ing the deficiency of another." The waste of meatin Canada, Australia, Tasmania, the Cape of Good Hope, South America, and other parts, is a fact too well known and too much regretted to be disputed, and for years the great question has been how to utilize the enormous quantity of food annually lost. In other words, the great problem to be solved was how good meat at the antipodes might be made available for home use at a low price, instead of the carcases being slaughtered merely for their fat, skin, and The solution of this problem has been attempted in various ways, which may be resolved into three distinct classes of treatment. These consist in preservation of substances by drying them, which is of very ancient date; preservation by excluding atmospheric air, which is also of considerable atmospheric air, which is also of considerable antiquity; and preservation by the application of cold. There have been many processes devised at various times for carrying and the several methods of treatment. It is not, however, our present purpose to describe these, for so many have proved failures. We shall therefore content ourselves by observing shall therefore content ourselves by observing that as the object is to preserve meat in a fresh state, with all its nutritious properties intact, the process of drying does not wholly commend itself, inasmuch as it involves the use of salt or some other antiseptic, and the product is salt provisions. The application of freezing which was thought a properties.

since, to have proved a success, has practi-cally failed, and we cannot learn of its adop-

As the deprivation of heat appears to have been unsuccessful, and the deprivation of moisture only gives us salt food, we must turn to the deprivation of oxygen as a means of obtaining really wholesome and nutritious food. This, in fact, is the process now generally employed by those who are engaged in the preservation of food. It is carried out in various ways—either by filling up the vessel with a heated substance; by destroying the oxygen of the air in the vessel by heating the substance in it; by exhausting the air from the vessel containing it; or by driving out the air by means of steem. This last is out the air by means of steam. This last is the method most commonly employed, and the method most commonly employed, and with invariable success. As an illustration of this system, we propose to describe the preservation of food as carried on by Messrs. John McCall and Co., at their works at Ramornie, New South Wales, and at Maribyrnong, Victoria, as well as at their London establishment, 137, Houndsditch, the latter of which we recently visited. We may premise that the two antipodeal establishments are that the two antipodeal establishments are known as the Australian Meat Company and the Melbourne Meat Preserving Company. They were formed for the purpose of preserv ing beef and mutton, and shipping it to this country for domestic use, as well as for that of the naval and mercantile marine as a substitute for salt provisions. The meat is stitute for salt provisions. The meat is imported in tin canisters containing 2lb., 4lb., and 6lb. each. Messrs. McCall and Co. have for many years preserved English provisions by the same process used in the colonies. The Australian Meat Company was formed in 1866, when Messrs. McCall were induced by the high price of meat in this country to propose to gentlemen interested in the vast cattle and sheep runs of Australia the erection of a manufactory for preserving meat in the colony. Those gentlemen entered into the project with spirit, and a manufactory was erected at Ramornie, on the Clarence River, New South Wales. During 1867 and 1868, 1,164,970lb. of preserved meat (principally beef) were shipped to this country. The attempts to bring Australian meat in a fresh state to this country have been many, but the Australian Meat were induced by the high price of meat in have been many, but the Australian Meat Company deserves the honour of being the first to bring large shipments, and, from their excellence, to find a ready sale for them. Indeed, the plan of preservation adopted by this company (viz., that of removing the air from the meat in the process of steaming), is the only successful plan by which Australian meat perfectly fresh, free from salting or smoking, has been imported. The Melbourne Meat Company commenced operations more recently, but with the same mode of preserving. Our statement with regard to the complete success of Mr. McCall's plan of preservation is borne out by the Food Committee of the Society of Arts, who reported, on June 26, 1867, as follows:—"They (the committee) have examined various plans, but the only one by which they have as yet found that unsalted meat in a solid eatable condition has been largely imported, is that followed by 'The Australian Meat Company.' The process is that long used for preserved provisions. The beef arrives in tins, from which the air has been excluded, and, from the heat employed, is sufficiently cooked to be eaten without further dressing. It may, however, be stewed and served hot, if preferred." Our own experience of the provisions preserved by this company is that they are a palatable and nutritious food, and we recommend those who have not yet tried the Australian beef and mutton, at once to make the experiment.

The Melbourne establishment at Maribyrnong is a well-organized factory, complete 90ft. by 30ft., where, on its arrival from the slaughter-house, the meat is cut up into joints, and the bones and surplus fat removed, previously to its being disposed of in the kitchen immediately adjoining. Over this room is another of the same dimensions, termed the "tin shop," capable of accommodating forty tinsmiths. About half that number of men are generally engaged in constructing tin canisters at the rate of about 12,000 per week. Chimneys are provided over each man's fire pot, to carry off the fumes of the charcoal, which are frequently found to be very injurious to the health of the workmen. Adjoining this is the machinery room, where various machines are in full operation for cutting up, rolling, stamping, and otherwise preparing the sheets of tin for the tinsmiths to solder together. Contiguous to this room and to the butcher's department below, is a spacious and lofty kitchen where the meat is submitted to various processes of cooking. When ready, the cooked meat is packed into the canisters and carried to the preserving department overhead by means of a lift. In this room the tins are soldered down completely airtight, with the exception of a small hole in the lid, by means of which the air is expelled. They are then placed in baths of a solution of chloride of calcium, which is raised to a very high degree of temperature by a steam coil. In these baths the tins remain from two to three hours, according to their size and the nature of their contents. From thence they are lowered into tanks of cold water in a room beneath, called the cooling room, it being desirable to cool the canisters as quickly as possible after preservation, to prevent the meat being over cooked, which is always the case when the canister is allowed to cool of itself. At the extremity of this room is another called the testing room. This is an apartment built of blue stone, and heated by the flues from the boilers being made to traverse it. An artificial temperature equal to that of the tropics can thus be obtained, which serves to discover any flaw in the tins which might have escaped previous observation, or any error made during the preserving process, so that the canisters which have passed this ordeal may with perfect safety be guaranteed to stand any climate in the world. Below this room are placed two large boilers in which steam is generated, and which serve also to boil the vats, placed in a room con-tiguous wherein the fat is converted into tallow. Alongside of these boilers is a steam engine of 16-horse power, used for sawing the wood with which to construct packing cases, for grinding bones, and for other purposes. Adjoining are capacious store rooms in which the tins are painted, labelled, and packed ready for exportation.

Similar to this establishment, although, of course, on a less extensive scale, is that of Messrs. McCall's, in Houndsditch. Here are all the necessary arrangements for preserving various articles of food, and manufacturing the tin cases for their storeage. Here, on our visit, raw food was being put into canisters and soldered down, a pinhole aperture being left in the lid. The canister is subjected to the heat of the chloride of calcium bath, until the contents are about two-thirds cooked; then, while the steam is blowing freely out, the pinhole is cleverly sealed with solder. Meat properly preserved in this manner will been for years. keep for years. For twenty-five, thirty, and even forty-four years has meat been perfectly preserved after similar treatment to the above, and thus we have a ready means of "providing against actual want in periods of unusual scarcity," and of equalizing the dis-tribution of food, so that the excess of one country may supply the deficiency of another.
This is of course of the highest importance in an economic point of view, in which respect the question of supply wears a threefold aspect, commend itself, inasmuch as it involves the use of salt or some other antiseptic, and the product is salt provisions. The application of freezing, which was thought, a year or two by the ground floor is a well-ventilated room, ing the supply of meat for domestic purposes,



we may observe that the Ramornie beef is sold retail at 7d. and the Melbourne mutton at feld. per lb. As the meat is without bone, this is equal to buying ordinary butcher's meat at 5d. to 5\flackddot do per lb. Next, the interests of the sailors in the Royal navy are concerned. According to a letter from H.R.H. the Duke of Edinburgh, the cost of preserved meat manufactured by the Admiralty is 11d. or 1s. per lb., and from its high price is only given to the men occasionally. The Australian meat can be supplied at a much lower price, and if preserved fresh meat were served out in turn with salt meat, both the British navy and the British taxpayer would benefit, while the vast number of cattle slaughtered at the Government yards would go to increase the meat supply of this country. Lastly, the mercantile marine is very much affected in the introduction of Australian meat as a preventive of scurvy among the men. The Board of Trade issued last year to all the local marine boards a proposed scale of diet for British seamen, in which preserved fresh meat and vegetables were included as preventives of this disease. The price of Australian meat being less than that of salt provisions must surely induce shipowners to make it a regular article of diet.

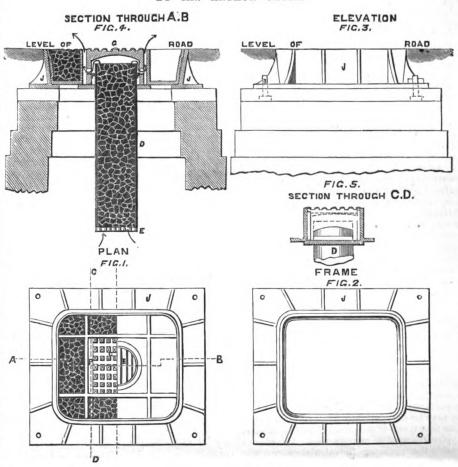
We have devoted some space to the consideration of the question of preserved fresh meat, because it is of importance as solving a meat, because it is of importance as solving a problem which has long troubled some of our colonists. The introduction of Australian meat on a large scale will greatly conduce to the better living of our working population, and better health of the Royal navy and mercantile marine. It is already influencing men's minds in various quarters. The recent opening of a depôt at Birming-ham has caused the butchers there to lower their prices, whilst attention having been drawn in the House of Commons to the matter of preserved meats for the navy, the Government has advertised for tenders for the supply of this desirable food. Instead of costing the country 11d. and 1s. per lb., our navy can be provisioned at 6d. or 7d. The meat has already been tried in the Royal navy, and very satisfactory reports have been received by the Admiralty, so that our sailors may now expect to be more frequently indulged with an agreeable and wholesome alternative to salt provisions at sea. Private shipowners are endeavouring to introduce it amongst their crews, but Jack is found to have suspicions that all is not quite fair and aboveboard. He thinks that because it is cheap his owner only wants to save a few pounds, not believing that his health is really of more value than the few pounds which may, per-haps, be saved on the run. However, Jack's scruples will, doubtless, yield when he finds his palate gratified and his health improved, so that we do not doubt but that in time the value of preserved meat will be fully recognized.

## SEWER VENTILATION.

VARIOUS have been the means proposed for safely getting rid of what may be termed the secondary contents of sewers. one time it was considered that, provided a sewer had a good fall, and that there was a constant and sufficient supply of water to effect the flushing, nothing more was required. In a word, if the first contents were thoroughly removed, there was nothing to fear. Experience, and, unfortunately, dearly earned experience, has proved that there is a great deal more to be dear. deal more to be done. Sanitary engineers are well aware that only half the task is accomplished when the sewage is conveyed away. There yet remains what we have called the secondary contents, which are in some degree the products of the first, and consist of the contaminated and vitiated gases existing throughout the subterranean conduit. There is not the slightest difficulty in removing

# SEWER VENTILATOR.

BY MR. ARTHUR JACOB.



these from the sewers. They will get out | fast enough of themselves, through everyhole and grating, that may place the interior of the sewer in communication with the outer The problem is not to let them atmosphere. out in this condition, but either to lead them away out of the reach of human nostrils and human throats, or to subject them to some process of purification before they are permitted to leave the sewer, and escape into the With the view of accomplishing the result desired by the former method, it has been proposed to transport them into large chimneys, and there consume them by fire. Some contended that the rain water down-pipes should be utilized for the purpose, but the serious objection against such a measure is, that frequently garret and upper a measure is, that frequently garret and upper storey windows are placed in very close con-tiguity to their mouths. In dealing with the disposal of sewage gases, the preferable plan appears to be to deodorize them previously to allowing them to pass from the sewers into the air.

A new design for a sewer ventilator has been recently patented by Mr. Arthur Jacob, C.E., which presents some features differing from those belonging to the ordinary methods in use. In fig. 1 is represented a plan, one half of which shows the cover C, placed over the upper part of the cylinder D (see figs. 1, 4, and 5), and the other, the grating E, fixed at the lower end of the cylinder, at the junction of the manhole with the sewer. The cylinder D is filled with charcoal (see fig. 4), and the sewage gases gain admittance to it through the grating E, already alluded to, as shown by the arrows. By virtue of their inferior specific gravity, they rise up through the interstices of the loosely-packed charcoal, and make their exit into the air by means of the slits or apertures P, placed for that purpose in the sides of the cover. One advantage of the substitution of the cylinder, filled with charcoal in the manner described, for the shallow trays hitherto employed, is

that a much larger surface of the deodorizing charcoal is available for effecting the purification of the gases, and, also, that as the operation is slower and more deliberate, it is accomplished with greater efficiency. Manifestly, the first point that a ventilator of this nature should ensure is that the deodorization of the gases should be thoroughly and substantially performed. If the gases, after undergoing the purifying action of the deodorant, still retain any offensive or injurious qualities, the whole apparatus is a failure, and a cause of needless and useless expense to the ratepayers. To keep every ventilator in which this principle is carried out in proper working order, the contents of the trays or cylinder, as in the present example, must be changed at intervals. The accomplishment of this, in a simple and rapid manner, is one of the chief meritorious features of Mr. Jacob's patent. Nothing more is required than for one man to go round with a cart containing a supply of fresh charcoal, to take off the cap C, lift up the cylinder, empty out the contents, replace them with a new charge, and drop the cylinder into its place again. A few minutes will suffice to accomplish what takes nearly an hour to get done under the ordinary plan in practice.

An elevation of the frame J is shown in fig. 3, with the holding down bolts and cottars, and fig. 5 represents a cross section through the cover, taken along the line C D, on the plan in fig. 1. In constructing the manhole for this ventilator, there is less excavation and brickwork required than in any other, as there are no side chambers needed. As a set-off against this saving, there is the cost of the cylinder, which is of galvanized iron, which would be in excess of the common trays. If a balance be struck, there will be no appreciable difference of cost between Mr. Jacob's ventilator and others in ordinary use. From the simplicity of the arrangement of all the parts, and the ready manner in which the charcoal can be removed and replaced, we

consider that the apparatus is calculated to be of great service to our cities and towns, and will tend to relieve local boards from one of the difficulties with which they have had to contend for some years. The recent sanitary regulations, and the summary manner with which they are enforced, have pressed so heavily upon all local corporate bodies, that they ought to hail with delight any invention or improvement that has a tendency to practically solve the question of the disposal of sewage and the ventilation of sewers.

#### NOTICES OF BOOKS.

THE manufacture of worsteds and carded varns is now one of the leading interests of America, so that a trustworthy practical treatise upon the subject forms an important adjunct to the manufacture. Such a treatise\* has recently reached us from across the Atlantic. It is a translation of M. Leroux's work, and comprises practical mechanics, with rules and calculations applied to spinning, sorting, cleansing, and scouring wools. It also describes the English and wools. It also describes the English and French methods of combing, drawing, and spinning worsteds, and manufacturing corded We have referred to the importance of this branch of industry in America. In support of this, we may observe that, even by the census of 1860, it appears there were then in the United Kingdom 1,263 woollen and worsted mills, and 712 wool carding establishments. In 1864, the total productions of woollens was estimated at 120,000,000 dollars. This industry has of late received a remarkable impulse, and is now of the first importance in the States. The volume before us may be divided into five principal parts. The first treats of the principles of mechanics applied to woollen manufacture. In order to enable the operator to calculate accurately the velocities required by the various pieces of his machinery, vary the pressures of the top rollers, according to the staple of the wool and the varn to be manufactured. Secondly, we have the properties and nature of the principal sorts of wool found in the market considered, as well as the processes for sampling, washing, and scouring any kind of wool, preparatory to its treatment, whether for combed or corded yarns. Next, we have a description of the French method of making worsteds (combed yarns), which differs from the English mode of operating, especially in the drawing processes, where the sliver is never twisted, but is only drawn out, at the same time that the fibres are constantly kept in a state of parallelism, by passing over a circular comb. Fourthly, we have described the English method of making worsteds, where the slivers are twisted at each operation. And, finally, the work treats of the manufacture of corded wool, which is about the same in both countries, except at the last stage of the operation, when peculiar styles of throstle frames are used instead of the mule. The book also contains numerous tables, which are the result of long experience, and will be found very use-The decimal system of weight and measures has been-judiciously we thinkpreserved, and at the end of the volume are tables and ready made calculations, by which the quantities in the text may easily be converted into English equivalents. In order that the volume may be rendered as complete as possible, such facts are added in connection with the Paris Exhibition of 1867 as throw light upon the latest and most important improvement in woollen machinery, manipulation and fabrics. The work is illustrated by twelve large plates, and, altogether, forms an important adjunct to the branch of

industry it illustrates. The translators deserve credit for a clear, methodical and faithful translation.

The question of valve gears and motions has been sufficiently discussed of late, in various ways by practical men, as to call for a third edition of Dr. Zeuner's treatise on the subject. This treatise\* has been revised and enlarged by its able translator, Mr. Moritz Müller, and now comes before the public with the results of all the recent investigations into the matter upon which it The first part of the work is devoted treats. to valve gears with one slide-valve, and embraces a consideration of simple valve gear with fixed expansion, and reversing motions with variable expansion. In the second part, the author enters upon the consideration of valve motions with two valves. The various link and valve motions are truly described, special attention being given to the locomotive link motion. A thorough instruction in the study of the action of valve motions is especially welcome to the designer, and he will meet with it in Dr. Zeuner's treatise.

Mr. Timbs is again before us with his "Year Book of Facts," t in which he gives a summary of the most important improve-ments and discoveries in science and art that have been made during the past year. The present volume is prefaced by a sketch of the life of Mr. Joseph Whitworth, a faithful portrait of whom faces the title page of the book. The "Year Book" is compiled from the usual reliable sources—the scientific journals-the Mechanics' Magazine amongst the number. It contains a great variety of information on the mechanical and useful arts, natural philosophy, electricity, chemistry, geology, astronomy, &c., and from it the progress made during the past year, in any of these branches of science, may be correctly ascertained. Those who desire to correctly ascertained. Those who desire to inform themselves of this progress, without going through the tedious processes of investi-

gation and research, cannot do better than consult Mr. Timbs' pages.

We have recently had to notice several trade circulars, which are got up in such a way as to form useful books of reference in many cases. Unquestionably, the best which has yet appeared has just been issued by the engineering firm of Appleby Brothers, Emerson-street, Southwark, and is published by Messrs. Spon, of Charing Cross. It contains some 450 pages, and forms a capital illustrated handbook of machinery and ironwork. In it are to be found the cost, working expenses, and results obtained in the use of steam and hand cranes, pumps, fixed and portable steam engines, and various other machines, with weights and measurements, &c. There are also the prices of tools, ironwork, stores, and materials required by civil and mechanical engineers and merchants. There are, besides, numerous tables and useful memoranda, the whole forming a ready book of reference on the subject of machinery The illustrations are prepared in in general. the best manner, and the type and binding are in Messrs. Spon's usual excellent style As a sample of the work, we give, on another page, a description of Furness and Slater's

steam filth hoist, by Appleby Brothers. Another elegantly bound and useful volume similar in character to the last, has just been issued by Messrs. Gwynne and Co., the hydraulic and mechanical engineers, of Essexstreet, Strand. It contains some useful remarks on drainage and irrigation, to which purposes Messrs. Gwynne's centrifugal pumping machinery is so well adapted. The engravings are well got up, and illustrate the various manufactures of the firm, and their

"Treatise on Valve Gear with Special Consideration "Treatise on Valve Gear with Special Consideration of the Link-Motions of Locomotive Engines." By Dr. Gustav Zeiner. Third Edition. Translated by Moritz McLler. London: E. and F. N. Spon, 48, Charing-cross. 1869. † "The Year Book of Facts in Science and Art." By JOHN TIMES. London: Lockwood and Co., 7, Stationers' Hall-court. 1869.

We need not point out special application. the many advantages of the centrifugal pump, which are well known from their extensive application. It is enough to say that Messrs. Gwynne have made this a special branch of manufacture, and they have brought it to such perfection that their pumps are being used for every conceivable purpose, with thorough success. Besides these pumps, Messrs. Gwynne manufacture every kind of hydraulic machinery, which is set forth in the book under notice.

The ninth volume of the "Transactions of the Institution of Naval Architects reached us a few days after the tenth annual meeting had commenced its sitting. It has put in a rather tardy appearance, which we thought was to have been facilitated rather than otherwise by the arrangements the council of the Institution made with one of the engineering periodicals, to which an exclusive right has been given to the use of the papers read, as against all other members of the press. However, it matters not to us, as we noticed at length the papers the volume contains at the time they were read a year since. But we conceive it must matter a little to the members and associates of the Institution, who were not able to be present at the meeting, that the report of the papers then read are not published until after another annual meeting has been held.

We are glad to see that Mr. Joseph Hogg has found it necessary to issue a fourth edition of his "Iron Trades' Guide," as it is of itself an evidence of the practical value of the book. This treatise comprises a series of tables on the weight and measurement of metals, stone, and timber. It also goes into the strength of materials, and the Govern-ment chain and anchor tests. Then we gather much valuable information respecting the tests of iron and steel of different makers, besides which, we obtain an insight into boiler making, forging, smith's work in general, iron rolling, moulding, pattern making, &c., &c. Proceeding to higher branches of the subject, Mr. Hogg gives some articles on girder making, sectional areas of angle irons, and pile driving. Then he adds a series of tables suitable for all kinds of business purposes, and a set of tables of weights, measures, and prices of oils. We thus have nearly 600 pages of matter of the first value to those engaged in the iron

Mr. Henry Dircks, C.E., &c., has just published, through Messrs. Spon, of Charingcross, two lectures on "Scientific Studies, or Practical in Contrast with Chimerical Pur-These lectures were delivered at the Literary Institution, Greenwich, so far back as February, 1864. The first is on the life of the Marquis of Worcester, the inventor of the steam engine, and with whom Mr. Direks has made us familiar in many pleasant ways. The second lecture is upon the chimeras of science, and includes astrology, alchemy, squaring the circle perpetual motion, &c. The lectures circle, perpetual motion, &c. The lectures are written in a popular style, and are well worthy of persual by the curious.

The thirty-sixth annual report of the Royal Cornwall Polytechnic Society (Simpkin and Marshall) is to hand. It contains a notice of the proceedings of the society for the past year, and an account of the various lectures. Amongst other communications on various subjects, is one upon the working of the Dering rock-boring machine. From this report, we gather that Doering's engine had been worked in the 185-fathom level in Tincroft Mine, conjointly with another, from the 6th of January up to September, 1868, and had driven sixteen fathoms in hard tin capel, which Captain Teague considered would cost £20 per fathom if driven by hand labour. During the greater part of that time (in consequence of the air pump getting constantly out of repair), the machine was only worked by one corps of two men; and continuous working with three corps, comprising five men



<sup>\* &</sup>quot;A Practical Treatise on the Manufacture of Worsteds and Corded Yarns." Translated from the French of CHARLES LEROUX by HORATIO PAINE, M.D., and A. A. FESQUET, Chemist and Engineer. Philadelphia: Henry Carey Baird, 406, Walnut-street. London: Trubner and Co., 69, Paternoster-row. 1869.

and one boy only, commenced on the 6th of Since that date nearly nine fathoms of ground had been driven at a cost of £17 18s. 2d. The following is the cost of working the boring machine during October, 1868:—Five miners and one boy, £24; one boy to remove rubbish, £2; two enginemen at surface, £6; one smith and boy, £5 5s.; oil waste and candles, £3 9s.; gun cotton for blasting, £4 10s.; fuse, 7s. 6d.; sundries, 3s.; coals, £6; repairs, £2; total, £53 14s. 6d. In this estimate, the sum of £21 5s. is for expenses at the surface, which would be slightly increased if three ends were driven instead of one, say about £2 15s.; this would reduce the average cost per fathom to £13 9s. 10d., instead of £17 18s. 2d. During the last three months, one corps has been worked by one man and a boy, and the result has shown that they will drive as much ground with the machine as two men could do in the same time.

"The Journal of the Royal Agricultural Society of England" (Murray, Albemarlestreet), contains the usual amount of valuable information relating to the various departments of husbandry. The most useful paper in the volume to agriculturists is that by Mr. J. C. Morton, in which he teaches "Some of the Agricultural Lessons of 1868." The produce of the past year was, in this country, grown under such extraordinary conditions, that Mr. Morton's agricultural history of the year cannot fail to prove highly instructive.

Mr. Henry Coxwell, the renowned aëronaut, has edited the "Aerostatic Magazine for It is a record of ballooning and flying during the past year. Mr. Coxwell deals very severely with the weak points of the Aeronautical Society, especially its exhibition at the Crystal Palace last summer. Coxwell despairs—and very reasonably, tooof flight ever being achieved by man by means of the appurtenances natural to birds. He disbelieves the guidance of balloons to any useful extent, but feels assured that a fair examination of the true principles of flight will advance aerial navigation.

Mr. Sampson Sandys published a problem for trisecting an angle geometrically in 1864. Having recently detected an error in it, he has corrected it, and now submits it to the judgment of geometers. The author has added to it a problem for doubling the cube geometrically. Mr. Westerton, of Hyde Park Corner, is the publisher.

OTES ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL APPLICATIONS.

A NEW METAL-BLEACHING WOOD STUFF-AN IM-

PROVED BATTERY—TUNGSTEN STEEL.

THE discovery of another metallic element, by means of spectrum analysis, is again announced—this time by Mr. Sorby, who found it in the course of an examination of some Cevlon hyacinths or jargon (zircon), as the stone is sometimes called. Hence, Mr. Sorby proposes to call the new metal jargonium. The characteristic spectrum of the supposed new element is a series black absorption bands, and in connection with these, it is right to mention that Professor Church, who is well known by his researches on some of the rarer and more expensive minerals, had noticed in 1866 that some zircons gave a series of black bands, from which he then inferred the presence of a new element, and pro-posed the name nigrium for it. Earlier still, Svanberg, by a chemical examination of zircon, came to the conclusion that it contained a till then undiscovered element, which he did not succeed in completely isolating from zirconium, but for which he suggested the name norium. Whether the metals thus independently discovered are one and the same, or three distinct elements, remains to be settled by a more com-plete examination. We fancy, however, that there can be little doubt that Professor Church's nigrium and Mr. Sorby's jargonium are identical. The minerals which contain these metals are so rare that the discovery is of little importance, except in a scientific point of view. But we must quote one practical application of Professor Church's discovery, which he pointed out in the "Intellectual Observer" for May, 1866.

The orange hyacinth, which shows these black lines very distinctly, is extremely rare, and very precious, and another and cheaper stone, cinnamongarnet, is commonly sold for it. This latter gives no black bands, and hence the spectroscope affords a ready means of detecting the imposition.

Wood stuff, for paper making, is difficult to bleach. Chloride of lime gives it a yellowish colour, instead of turning it white, and, if the stronger acids be used, the stuff is apt to turn red, when exposed to air, sunlight, and moisture: more especially, if the acids employed contain a little iron. Orioli states that oxalic acid is the best bleaching agent to employ. He uses it in the proportion of four-fifths of a pound of the acid to 1001b. of the stuff, and adds as well 21b. of sulphate of alumina, which must be free from iron. The oxalic acid bleaches, and the alumina, it is said, fixes the decolourized matter as a colourless lake. Oxalic acid is a very good bleaching agent for many animal and vegetable substances.

We have recorded so many improvements (as they are all called) in galvanic batteries, that the number and variety becomes bewildering. The last we meet with is that suggested by Böttger, who proposes to substitute metallic antimony for An amalgamated zinc plate is immersed in a strong solution of common salt and sulphate of magnesia. The antimony, like the carbon, is placed in a porous pot; but the liquid used is dilute sulphuric acid. A combination of this arrangement is said to give a stronger and more lasting current than a cell of Daniell's battery

It is many years since Mr. Mushet proposed to alloy iron with tungsten in the formation of steel. We reported a year or two ago that M. Leguen, in France, had made experiments with the same alloy, employing iron converted by Bessemer's process. Then he used a common grey pignot fit for conversion, but produced, novertheless, an alloy of very good quality. Lately he has continued his experiments, now employing good white cast iron, and has produced a steel of excellent quality. A portion A portion of the iron is first alloyed with one-tenth wolfram. in a cupola furnace, and is added to the rest in the convertor. The conversion is carried further than usual, so that the carbon is reduced to onehalf the ordinary proportion. The steel so produced is soft, but very tough, and tempers remark. ably well. M. Leguen mentions that it will be found extremely useful for machines, some parts of which require to be tempered while others are kept soft. The objection brought against this alloy is that it is expensive, but the amount of tungsten employed by M. Leguen is so small-only 0.55 per cent.—that it can make but a very small addition to the cost of the steel.

# ON THE USE OF LOGOTYPES. By C. W. Felt.

A T a meeting of the Manchester Literary and Philosophical Society, held March 9, 1869, the following paper on the Use of Logotypes, by Mr. Charles Wilson Felt, of Salem, Massachusetts, was communicated by Professor Jevons, M.A.:-

I have recently brought to England, for the purpose of practical introduction, a series of inventions for the more rapid composition of printer's typo. These inventions have been gradually perfected during many years spent in experimenting; but as my present purpose is to notice only one of the auxiliary improvements, I pass over the mechanical inventions with the remark that the difficult operation known as "justification," and supposed by printers to be beyond the possibilities of mechanism, has been

successfully accomplished.

The work of the printer is of course largely controlled by the nature of language, and yet typographers seem to have entered the domain of literature only so far as to make a somewhat rude estimate of the number of the various letters and characters employed. It has been many times suggested that two or more letters might be cast together, or even whole words cast in and many times, too, have these suggestions proved unsuccessful in practice. One of the earliest attempts was made by Earl Stanhope, who laboured most earnestly to improve the low condition of the printer's art in his time, and though the Stanhope press succeeded, the logotypes were a failure. more successful scheme was conceived some twenty years ago by Mr. John H. Tobitt, son of a London choolmaster, who emigrated to America when a boy, and afterwards established himself as the "Combination Type Printer." His success was His success was acknowledged by the grant of silver medals at the

No previous systems, however, were based upon careful attempt to discover a law of language, so that but very few logotypes have been adopted in common by different experimenters, and each has launched off into a series of his own, strangely varying from those of others. A little reflection must convince us that few things are more amen-able to the rule of averages than the frequency of combinations of letters, provided that we be willing to undertake the labour requisite to ascertain the most frequent combinations in a thorough

It is a curious instance of the rarity of original investigation that we have been willing to spend great amounts of time and money without making the proper inquiry into the comparative frequency of words and combinations of letters. Mr. Babbage, while engaged upon his calculating engine, had occasion to examine tables of logarithms, and discovered that the same errors were to be found in various tables which were supposed to be founded on original calculations. Certain Chinese tables were even found to be copies of the same defective originals, and it is wonderful how ready men are to copy the imperfect labours of others, rather than to undertake the task thoroughly themselves.

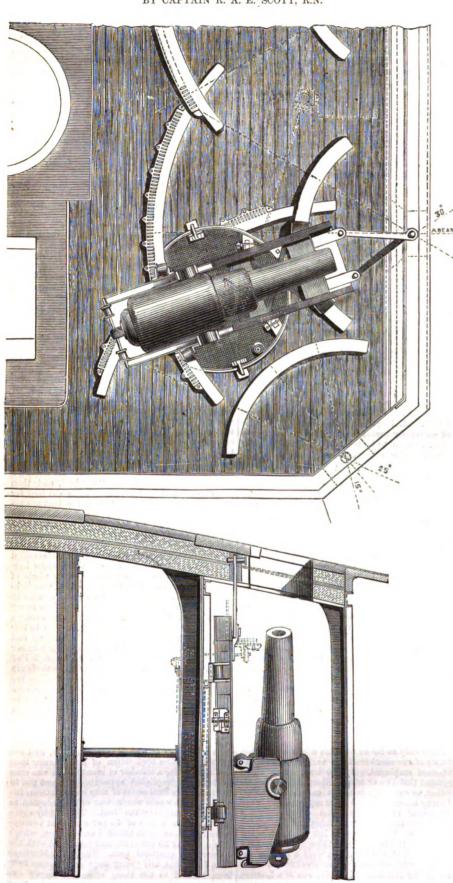
Ten years ago I took this matter in hand, and gradually reduced it to a system which is applicable to other languages as well as the English. My aim was to discover a number of the most frequently occurring combinations, large enough to make a considerable gain in composition, and yet not so large as to render the printer's case inconvenient or to overtax his memory. After some preliminary trials, twenty-five samples of English composition were ultimately selected from the following classes of literature:—Current literature, newspapers, standard authors, scientific works, legal works, modern poetry, old English prose, old English and burlesque poetry. Three of each class, except the last, were fairly selected, and 10,000 characters (or 250,000 in all) were taken from each for the sake of easy comparison. The samples were then subjected to an exhaustive analysis, a table being made of twenty-six lines and twenty-six columns one for each letter of the alphabet, and in each space were placed the number of times the letter at the left of the line immediately preceded the letter at the top of the column. Thus the word "column" would give the combinations co, ol, lu,
um, and mn. The first and last letters of a word, indeed, can appear but once, while the others appear twice, but the table gives a correct idea how many times two letters are found in conjunction in a sample of 10,000 characters.

The next step was to select the best, and then recur to the text, and carefully trace out how far those combinations which appear the best are injured by other combinations. For instance, in the word "are," shall we take ar or ie? Both are word "are," valuable, and it is a question for another investigation whether the whole word should not be taken. To complete this investigation certain tables called "glossaries" have been formed, which show how many times each word is repeated in the whole of samples and in each 1,000 characters. These glessaries have been printed in an octavo volume of 514 pages, and it is surprising to find how many words occur but once in samples which average about 2,000 words, and contain from 500 to 900 different words. Another table is made up and also printed, showing the words and their number occur more than once in the nine samples of matter in most frequent use, and of these there are These tables, besides re-1,103 different words. vealing many interesting facts, prove conclusively that any attempt to cast the whole words must be limited, and that the greatest care should be taken to select the best.

The work of comparing the various combinations to ascertain how far they would interfere with each other, was of a most tedious nature, and re-quired the close application of many young men and women for a number of months. It was once or twice accomplished approximately and put to the test, and a final series of fifty combinations, including some whole words, was at last adopted as being demonstrably the best. These fifty combinations give a gain of 35 per cent., but twentythree have been again selected out of them, which give a gain of 25 per cent., and have met with the approval of practical men. These combinations have been cast, and young men and women have been trained to use them upon newspaper and other work. Practice has thus been founded upon theory, and it need only be further pointed out that, the combinations once determined, are applicable not only to printing, but to telegraphy and phonography.

### GUN-WORKING MACHINERY ON BOARD "HERCULES." H.M.S.

BY CAPTAIN R. A. E. SCOTT, R.N.



GUN WORKING MACHINERY OF THE "HERCULES."

IN our issue for January 22 last, we described and illustrated Captain Scott's turntable system of working broadside guns. We now give particulars of that system, as carried out in the "Hercules," by the inventor. It has been adopted by Mr. E. J. Reed, the Naval Chief Constructor, in the casemate of that fine vessel. It will be seen that by means of the gear work shown by the dotted lines the turntable is caused to by the dotted lines the turntable is caused to revolve much in the way frequently adopted at railway stations. By means of the rack racers the gun can be trained right and left when in the port without further aid from tackle. The corner port looks forward and enables the gun to be fired in a

looks forward and enables the gun to be fired in a line within a few degrees of the keel.

In a recent trial of these gun carriages on board the "Hercules" they appear to have given the utmost satisfaction. On the arrival of the vessel at Lisbon, Admiral Sir T. Symonds, commanding the Channel Squadron, took his squadron to sea for an eight days' cruise immediately. The weather was stormy, blowing a N.E. gale, accompanied by violent squalls of hail a great part of the time. The confidence and ease with which the men handled the ponderous 18-ton guns, mounted upon the new pattern Scott carriage, and the wide sweep attainable by each broadside gun, astonished the inspecting officers, while the vessel was working round and firing at a target. The steadiness of the "Hercules" as she presented her broadside to the Atlantic swell and the wonderfully quick manner in which she obeyed each motion of her helm while moving round the target, elicited unhelm while moving round the target, elicited unqualified admiration.

#### MINING PRIMERS.

SINCE the appearance in our columns of a paper CINCE the appearance in our columns of a paper on "Explosive Compounds for Engineering Purposes,"\* read before the Society of Engineers by Mr. Perry F. Nursey, we have had several enquiries respecting the new method of exploding charges adopted by Mr. Nobel for dynamite, and the Patent Safety Gun Cotton Company for their compressed gun cotton. This method, it will be remembered, consists in using a detonating fuse, which is inserted in the charge, and which developes all the active energy of an otherwise company. velopes all the active energy of an otherwise comparatively harmless material, in the open air. These mining primers, as they are termed, are prepared for use with the ordinary time fuse, as well as for electrical firing. The accompanying cut shows



one of these primers, which consists of a copper tube A, containing the fulminate, B is the ordinary mining fuse, which is inserted in the tube. In firing a shot, the fuse is inserted in the tube, the iring a shot, the fuse is inserted in the tube, the opening C being nipped upon it with a pair of pliers. This tube is then inserted in the fuse-hole of the charge, within about \(^3\)\_in. of the point C, and afterwards fired. Under all circumstances, a greatly increased effect is stated to be produced by the use of these primers in firing gun cotton charges, but more especially will their value be manifest in broken ground or rock, where otherwise the full power of gun cotton is not developed.

developed.

The value of the invention and its wide application will be understood when it is explained that an ordinary charge of compressed gun cotton placed on the ground and ignited by an ordinary fuse or match burns without explosion and comparative charge contributions. fuse or match burns without explosion and comparatively slowly, producing no destructive effect; whereas a similar charge, still unconfined, fired by a fuse with the primer attached, explodes with a report like a cannon, producing destructive results greater than those obtained with gun cotton fired in the ordinary way, under conditions most favourable to its action. In quarrying and mining, it is found that with the use of these primers there is no absolute necessity for tamping, but the hole no absolute necessity for tamping, but the hole may be fired at once upon the insertion of the charge. It is best, however, to pour down some loose sand or broken rubbish to hold the fuse in position. For submarine work, it has hitherto been necessary to confine the charge in very strong cases or shells in order to develope its power. With the use of these primers, however, the full effect is obtained without any such assistance, it being only necessary to enclose the charge in a water-tight case or cover. water-tight case or cover.

• MECHANICS' MAGAZINE, February 5, 12 and 19, 1869.



LEDGER'S RAILWAY SIGNAL.

MR. HENRY LEDGER, builder, of Hulme, is now exhibiting in Manchester a working model of an apparatus for railway train signalling, which, from its entire novelty, and inexpensive character, will doubtless receive the attention its merits deserve from the managers of railway companies. Mr. Ledger provides a thoroughfare of ample dimensions through the whole length of the carriages, and from one carriage to another, if necessary, by forming a doorway and fitting a door to each compartment, and, if necessary, at the ends of the carriages. These thoroughfares and doors are above the seats, and the doors slide up and down in grooves behind the seats, so that when closed they afford all the privacy to each compartment which at present exists. When closed, the doors are fastened by means of a self-acting hook, which is acted upon by a lever connected to a rod, running along the whole length of the roof of the running along the whole length of the roof of the carriage. In each compartment a chain is suspended, which is connected to an arm branching from the longitudinal rod, so that when the chain is pulled by a passenger, the longitudinal rod turns partially, and thus the hooks release all the doors in the carriage, and open up a communication through the sliding doorways between all the compartments. At the same time, the doors, in falling, come in contact with two levers connected by chains, passing over guide pulleys to semaphore signals mounted on each side of the carriages, so signals mounted on each side of the carriages, so that the semaphores are thrown out to signal in which carriage the guard is wanted. At the same instant, the chains connected with the actuating lever of the semaphores, by means of a peculiar clutch attached to them, pull the ordinary cord or rope which passes from one end of the train to the other thus actuating the harmons of according to other, thus actuating the hammer of a gong either in the guard's van, or on the engine, or both; or, if connected with the steam whistle, it sounds an alarm. An indication is also given from which compartment the chain has been pulled, by a selfacting latch, which, when once released, renders it impossible to replace it in its original position without the use of a key made expressly to suit it. The whole mechanism of this apparatus is enclosed, so that it is impossible to tamper with it.

NOVEL AND USEFUL APPLICATION OF THE ABYSSINIAN PUMP.

MR. H. HALL, of Sheriff Hill Colliery, has succeeded in applying the principle of this invention, with complete success, in a mining operation of no slight difficulty. The circumstances under which the application took place are thus detailed in the "Newcastle Daily Chronicle":—A particular seam of coal was subject to inundation from a large feeder of water, rendering a great amount of pumping power necessary in the working of the coal. The water was found to proceed from an old pit, which had been smk many years ago to the deeper and more valuable seams, and had become gradually filled with rubbish, consisting principally of old shaft timber, stones, &c., up to the level of the seam in question, thus forming an obstruction to the water, which otherwise would have passed down the shaft and found an outlet at a lower level by means of old workings. Numerous attempts had previously been made by boring to pass the water down, but without success, the timber seeming to form an impassable barrier. Mr. Hall being favourably impressed with the success which had attended Mr. Norton's patent for sinking wells, resolved to test its capabilities in passing through a material which had been proved impenetrable to the common bore rod. Mr. Ridley, from Messrs. Mather and Armstrong, of Newcastle, licencees of the patent, undertook the management of the apparatus. An 801b. weight and a 14-inch tube were used. When two hours had expired from the commencement of the operation, the tube was found to have been driven a distance of 20ft., the speed varying considerably. The succeeding 15ft. were overcome in four hours. At this point the process became much slower, but never stationary, the next 3ft. requiring two hours' labour; then 3ft. at a considerably increased speed, occupying only half an hour. The water was now laid on to the pipe and found to pass freely, and the driving was discontinued, 41ft. having been overcome in eight hours and a-half. Had it been necessary, it seemed quite possible to have driven the tubes to the ext

FLOATING OF THE "CAPTAIN."

AST Saturday witnessed the successful floating of the "Captain" from the works of Messrs. Laird Brothers, of Birkenhead. This vessel was designed by Captain Cowper P. Coles, R.N., C.B., designed by Captain Cowper P. Coles, R.N., C.B., and is the embodiment of the turret system with which the gallant officer's name has become identified. The principal dimensions of the "Captain" are as follow:—Length over all, 335ft; ditto between perpendiculars, 320ft.; breadth extreme, 53ft. 3in.; tonnage, 4,272 tons; draft of water abaft, 23ft. 6in.; ditto forward, 22ft. 6in.; height of freeboard or upper deck gunwale above water-line, 8ft.; beight of portsill in turrets above water-line, 8ft.; height of portsill in turrets above water-line, 10ft. There are two separate pairs of double trunk engines, each pair driving a separate serew propeller 17ft, in diameter. The collective nominal power is 900-horse power, and the in-dicated horse power will be not less than 5,400. There are surface condensers, jacketed cylinders, and appliances for economizing fuel. The four cylinders have each an effective diameter of 80 in., with a stroke of 3ft. 3in. The steam is supplied from eight boilers, having twenty-eight furnaces. The hull of the ship is wholly protected by armour fitt below the water line to the water line. The hull of the ship is wholly protected by armour from 5ft. below the water-line to the upper deck gunwale, right fore and aft, thus affording complete protection, not only to the midship part of the ship, where the machinery and turrets are placed, but also to the quarters for officers and men. The thickness of armour opposite the turrets is 8in., and on the remainder of the midship portion 7in., slightly reduced towards the ends. These plates rest on a backing of East India teak 12in, thick, through which they are bolted to the skin of the ship, which is 14in. thick (formed of two 4in. plates), the whole supported by massive framework 10in. deep. This backing is further supported by longitudinal girders 10in. deep. The upper deck at the level of the top of the armour is covered with iron 1½in. of the top of the armour is covered with iron 1½in. thick for the length of the turret spaces, and with lin, over the remainder, supported by iron beams 14in. deep and covered with teak 6in. thick. The general construction of the hull of the ship is similar to that of other large armour-clad ships built for her Majesty's navy, and combines a complete arrangement of water-tight compines a complete arrangement of water-tight double bottom, wing passage and other bulkheads. The fore-end especially is made of enormous strength, and terminates in a massive wroughtiron stem, formed as a ram for running into an enemy's ship.

The arrangement of the "Contraction"

enemy's ship.

The armament of the "Captain" will consist of six guns, four of which are to be carried in the turrets, and two on the upper deck. The guns in the turrets are to be 600-pounder 25-ton guns; those on the upper deck, at the fore and aft end, are to be 100-pounder 64-ton chase guns. The turrets, two in number, each carrying two 600-pounder 25-ton guns, project through circular openings in the upper deck. That part exposed to shot is covered with armour-plates 10in thick about the ports and for one-third the circumference, and with plates 9in thick for the remainder; while the lower part of all the gearing is protected by the 8-inch armour on the sides of the hull. The height of the centre of metal of the guns is 12ft. above the water-line, which will admit of them being fought at sea in very heavy weather; and they will have an are of training from the foremost turret of 154deg., and from the after turret of 156deg. The turrets are each 27ft. external below the armour shelf is constructed in a cellular form, large openings being left for entrance and for and 22tt. 6in. Internal diameter. The lower particle below the armour shelf is constructed in a cellular form, large openings being left for entrance and for passing in ammunition. These openings serve also to ventilate and light the lower decks. The turrets are supported by a strong girder on lower deck, and revolve on a series of cast-iron rollers, being kept in position by a solid wrought-iron central spindle, securely fixed in the deck and carried down to the orlop deck, and are fitted with a complete system of hand-turning gear in addition to the steam gear. This steam gear is worked by a separate pair of engines for each turret, placed on the orlop deck below the turret, where they are thoroughly protected from any chance of injury. The gear for starting these engines is so arranged that it may be worked either on the lower deck outside the turret, or, by a system of rods, led up through the central spindle to the sighting platform by the captain himself, who can thus take aim and direct the guns in the turret.

the turret.

The "Captain" is built with a poop and forecastle, which offer advantages when steaming head to wind at sea, and, in the present case, offer but little obstruction to the training of the guns. The poop and forecastle are connected by a centre spar deck, 26ft wide, which runs over the turrets, giving free communication from one end of the ship to the other, in all weathers; and the area of this deck will be sufficient to admit of the whole working and maneuvring of the ship. The hatchways round the funnel and amidships are carried up of iron, forming at once a the turret.

support to this deck, and a system of ventilation permanently trunked up to a height of some 23ft, above the load water-line. In order to enable this deck to resist the concussion from the explosion of deck to resist the concussion from the explosion of the guns when fired beneath it, it has been framed of iron, the part over the turrets where it is necessarily unsupported being carried by deep fore and aft girders, which will be used as hammock nettings, and the whole of the under side\_of the beams being plated over with steel plates. Arrangements are made on spar deck, forecastle, and poop for storage of boats, anchors, &c., and there is a complete fixed bulwark 3ft. 6in. and 4ft. high all round. The space thus provided for working the ship leaves the upper deck clear from the poop to the forecastle for the training of the turret guns, one of which can be fired from within 6deg. of the line of the keel forward to 6deg. of the line of keel aft, the only obstacle being the foot of the main tripod, which occupies but little space. Light iron stanchions, fitted with wire rope, take the place of hinged iron bulwarks at the upper deck level, and are lowered into the hollow water way when preparing for action.

The "Captain" is fully rigged as a ship. The

water way when preparing for action.

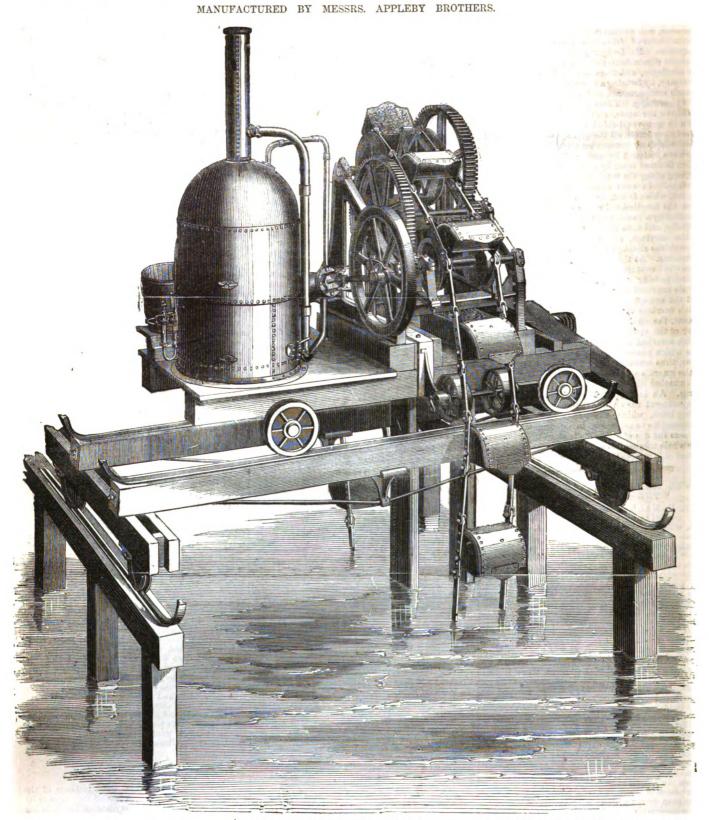
The "Captain" is fully rigged as a ship. The lower masts, which are made of iron, are on Captain Coles' tripod system, and are so arranged, that the tripods of the foremast and mizenmast come into the forecastle and poop, and the upper rigging is attached to the spar deck, above range of fire. There is, therefore, no obstruction to the training of the guns, except from the foot of the main tripod, one great objection to the turret system for sea-going full-rigged ships, namely, having the fire of the guns masked for the whole length of the rigging, or, on the other hand, risking the safety of the masts by letting go all but one or two shrouds, is, therefore, avoided. The space under the poop and forecastle, and between the upper and lower decks, is appropriated to the accommodation for officers and crew. The two turret spaces are particularly roomy. In the centre part a large space is bulk-headed off so as to be used as a supplementary coal bunker, holding about 200 tons of coal, in addition to the 600 tons which are to be stored in the regular bunkers. Below the lower deck are the magazines, shell-rooms, water tanks, prevision rooms, and all the storerooms, in the lower deck are the magazines, shell-rooms, water tanks, provision rooms, and all the storerooms, in addition to the engines, boilers, and coal bunkers. addition to the engines, boilers, and coal bunkers. The magazines and shellrooms are very conveniently arranged, there being two of each, one below each turret, so that the shot and shell may be hoisted direct into the turret spaces. Captain H. T. Burgoyne, R.N., V.C., has been appointed to the command of the "Captain," which now lies in the Alfred Dock, completing her internal fittings.

the "Captain," which now lies in the Alfred Dock, completing her internal fittings.

It will not be uninteresting, inconcluding our notice of the "Captain," to refer to those vessels which have been previously constructed by Messrs. Laird, upon the turret principle as developed by Captain Coles. These have been the "Scorpion" and the "Wivern," of 1.800 tons, and 350-horse power, each vessel carrying two turrets armed with two 300-pounder guns in each. The "Huascar," built for the Peruvian navy, of 1,100 tons and 300-horse power, with one turret carrying two 300-pounder guns. The "Bahia," for the Brazilian navy, of 900 tons and 140-horse power, with one turret carrying two 150-pounder guns. The "Lima Barros," for the Brazilian navy, of 1,323 tons and 300-horse power, carrying two turrets with two 150-pounder guns in each. The "Prince Hendrik," for the Dutch navy, of 2,100 tons and 400-horse power, carrying two turrets with two 306-pounder guns in each. The "Helligerlee" and the "Krokodil," for the Dutch navy, of 1,525 tons and 140-horse power, each carrying one turret with two 300-pounder guns. The "De Stier," for the Dutch navy, of 1,326 tons and 350-horse power, carrying two turrets with two 300-pounder guns. The "De Stier," for the Dutch navy, of 1,326 tons and 350-horse power, carrying two turrets with two 600-pounder guns in each. Making in all, ten ships, carrying fifteen turrets and twenty-six heavy guns.

Science and Art.—A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVT.]

# SLATER'S DREDGING MACHINE. MESSRS. FURNESS AND



FURNESS AND SLATER'S STEAM EXCAVATING AND DREDGING MACHINE OR FILTH HOIST.

THE annexed engraving represents this simple and efficient machine at many and efficient machine at work upon a staging, excavating under water previous to sinking iron caissons, or making a coffer dam of the ordinary construction for sea or river walls, docks, founda-tions of piers, &c. The characteristic features of this machine consist in its great simplicity, effi-ciency, and economy, and that it will excavate under water, sand, gravel, or clay, at infinitely less cost and time than by bag and spoon, divers, or any other mode of working hitherto adopted; that the work may be carried on continuously in any state of the tide, and that when the coffer dam has been formed, the entire excavation of the dam

may be accomplished by this machine without the great expense and loss of time usually incurred in pumping, tide work, &c. Some idea of the working expenses may be formed from the fact that it usually excavates from 20 to 30 yards of stuff, lifting it from a depth of 40ft., and discharging it into a barge within the hour, the hands employed being—one engine driver and two labourers, and the consumption of fuel 40lb. of coal. For sea or river works, the machine may be worked as an ordinary dredger fixed on a barge, or as an exca-

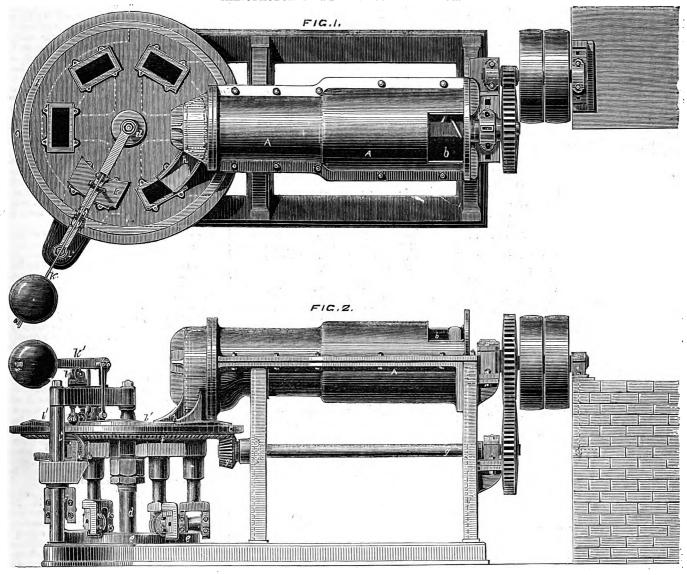
venient position. For working upon a staging, the whole is mounted on a truck which travels, and can be readily moved, either longitudinally or transversely, on a gantry similar to those used for an ordinary overhead travelling crane, and which can usually be made of sufficient span to take the whole of the excavation. The jib or ladder for carrying the buckets is in the form of a telescope slide, and may be elongated as the work progresses, to any required length up to 40ft. or 50ft. It is hung underneath the machine on a centre pin; vator travelling on staging, as may be most convenient, and after being used on the one, it may be readily transferred to the other. It is equally applicable for excavating cuttings for railways, sewers, or any similar work.

The engine is attached to the main framing of the machine, and the boiler is placed in any contracted places, or take a long face of work, as required. In excavating clay or other intractable strata, there has hitherto been considerable difficulty in discharging the buckets, but in this machine there is a self-



#### JOHNSON'S BRICK-MAKING MACHINE.

MANUFACTURED BY MR. T. R. TAYLOR.



acting arrangement, which entirely empties each bucket as it arrives over the shoot which conveys

it into the barge or waggon beneath.

As the main drainage in towns is at present greatly on the increase, the inventors have especially greatly on the increase, the inventors have especially adapted this machine (with some slight modification), as a filth hoist, at pumping stations, for elevating the sewerage from low level to high level, there being always a considerable deposit that pumps will not bring up. The patent has been purchased by Messrs. Appleby Brothers, of Emerson-street, Southwark, who are the sole manufacturers of the machines, and from whose recently published "Handbook of Machinery and Ironwork" we have extracted the above partiwe have extracted the above particulars.

# BRICK-MAKING MACHINERY.

MR. C. G. JOHNSON, of Portrack House, Stock-M. C. G. JOHNSON, of Portrack House, Stockton-on-Tees, has recently patented some improvements in machinery for making bricks. These improved machines are now being manufactured by Mr. Thomas R. Taylor, of the Cargo Fleet Steam Brick Works, Middlesbrough, who has also introduced in them the very efficient oil die and self-acting cutter of Mr. S. S. Anderson, of Bishop Anokland. Mr. Taylor has also combined with it Auckland. Mr. Taylor has also combined with it his excellent pug mill, so that the apparatus as turned out, includes three distinct patents. In the present arrangement, the principle is the employ-ment of Mr. Taylor's pug mill, in combination with moulds set in a table, revolving beneath an aperture in the pug mill. The boxes are brought in succession opposite the orifice of the pug mill, and are filled with clay. The material in the moulds are subjected to pressure by a piston which forms the bottom of the mould, being forced upwards, whilst

the top of the mould is at this time covered over. The bricks are subsequently discharged from the moulds by cams or levers, and are removed. In our engraving, fig. 1 shows a plan view, and fig. 2 a side view of Mr. Johnson's brick-making apparatus. In this machine the pug mill A is placed horizontally, and is fed with clay through an opening b formed through the side of the casing of the ing by formed through the side of the existing of the pug mill at one of its ends. At the opposite end is the exit orifice, and below this orifice is the table c carrying six moulds suitable for moulding bricks. The table is carried by a central pillar d, around which it revolves. The piston or plunger which forms the bottom of each mould has a stacked to it. by a screw or socket. At the lower end of this rod is a roller running on a fixed cam surface e, which is concentric with the axis of the revolving table. On the under side of the table, and near its table. On the under side of the table, and near its periphery, is formed a toothed wheel  $f_i$  into which gears a toothed pinion  $g^1$  on the axis g. This axis is driven by toothed gearing from the axis of the pug mill; thus, as the axis of the pug mill revolves, the table g revolves also, and the moulds carried by it are thus in succession brought below the exit orifice of the pug mill and are from it fed with material to be moulded into a block.

The moulds after passing below the orifice of the pug mill are for a time covered over by a fixed plate h, so that no portion of the top of the mould may be uncovered, whilst any other portion of the top of the mould is below the exit orifice of the mill; the material in the mould is thus left with a more or less even surface. on its top. As the table revolves the moulds are brought under a plate t, which is pressed downwards by the weighted lever t 1. This plate is relieved from pressure at the time when the mould com-

mences to pass under it by the weighted leve being there held up by a roller l at the upper end of the rods, which at their lower end carry rollers running on a cam surface l 1 on the top of the table. The outer circumference of the table is at table. The outer circumference of the table is at this spot supported by a roller, so that no strain may come upon the pivot upon which the table revolves; the axis on the weighted lever  $k^{1}$  is carried by bearings on a bar passing from the top of the central pivot to a pillar l, which stands up at the side of the table from the bed of the material pivot to a pillar l. at the side of the table from the bed of the machine. When the mould is below the plate, and just before the piston which forms the bottom of mould is caused to rise by the cam surface e, the cam surface l<sup>1</sup> on the top of the table allows the lever k<sup>1</sup> to again press down the plate k, so that the top of the mould may be then covered over by the weighted plate, and the amount of pressure to which the materials in the mould may be subjected will be limited by the weight on the lever k<sup>1</sup>. When the moulds have by the revolution of the table been carried past the plate k, the pistons which form the bottoms of the moulds are again caused to rise by means of the cam surface e, and so the moulded bleck is lifted up out of the mould, and is then removed by hand. The moulds are then by the continued revolution of the table again brought under the exit orifice of the pug mill, and are thus again filled with material, which is again subjected to pressure and then discharged as described.

# MAKING AND APPLYING ANILINE BLACK.

A NEW method of producing aniline black and applying it in practice has been patented by Mr. James Higgin, a manufacturing chemist, of Manchester. His improvements in producing

aniline black upon textile fabrics consist, first, in a new method of making chloride of aniline, which salt has been found the best for the production of aniline black, being either used as such in the preparation of the colour or formed during the process of agoing the printed goods by double decomposi-tion. Instead of combining the aniline with an acid as at present when making aniline black printing colour, it is mixed with a solution of a metallic chloride, the base of which is not injurious to the proper oxidation of the aniline. means the aniline combines with the chlorine in definite proportions, and chloride of aniline free from excess of acid is formed. According to the metallic chloride used the metallic base is in some cases either wholly or partially precipitated, and in other cases no precipitation takes place, a liquid being obtained containing aniline, chlorine, and the metal. Mr. Higgin has found the sesquichlorides of iron and chromium most suitable this purpose. When operating with sesquichloride of iron and aniline the proportions used are 100 parts by measure of aniline of commerce, and according to the saturating power of the aniline, from 250 parts to 280 parts by measure of a solution in water of sesquichloride of iron, containing iron equal to twelve grains of peroxide of iron in 100 grains measure.

When operating with sesquichloride of chromium the following proportions are used:-100 parts by measure of aniline of commerce, and from 400 to 450 parts by measure of a solution of seaquichloride of chromium in water, marking 50deg. on Twaddell's hydrometer. These mixtures may be used in place of the chloride of aniline of commerce in the aniline black made with sulphide of copper, using such a quantity as will contain as much aniline as in the quantity of chloride of aniline employed. The inventor prefers to use a compound of copper not hitherto used in making aniline black, and this forms the second portion of his invention. The copper compound employed is the disulphocyanide, which possesses the advan-tage of insolubility in dilute acids, and conse-quently is not dissolved by the chloride of aniline. It has, further, the property of not becoming oxidized in the presence of chlorate of potash until the colour is printed and dried. A soluble copper salt in the colour when printing is thus avoided.

Mr. Higgin makes the disulphocyanide as follows:—He dissolves crystallized sulphate of copper and crystallized sulphate of iron in water in the proportions of two parts of the former and three of the latter, and adds solution of sulphocyanide of potassium or other alkaline sulphocyanide as long as a white precipitate falls. After allowing this to settle he pours off the clear liquid and adds boiling water acidified with muriatic or sulphuric acid, and after well stirring allows it to settle, and pours off the clear liquor. This process is repeated until the precipitate has become perfectly white, when it is poured on a filter and drained until one gallon of the paste weighs 16lb. With this paste, and either of the aniline preparations named above, Mr. Higgin compounds aniline black printing colour as follows :

Number One.—5% pints of water, and 141b. starch; boil and add 8oz. chlorate of potash in starch; boil and add 8oz. chlorate of potash in powder, cool, and when nearly cold add 33oz. measure of perchloride of iron solution (containing in 100 grains measure iron equal to twelve grains of peroxide of iron). When quite cold add gradually 12oz. measure of aniline of commerce, and when this is well mixed add 1 toz. of disulpho cyanide paste; mix well and strain through a cloth. This colour is then ready for printing with. If the aniline is of average saturating power there will be no perchloride of iron in excess.

will be no perchloride of iron in excess.

Number Two.—Five pints of water, 1½lb. of starch; beat up the starch with a little of the water, and add 1½oz. of disulphocyanide paste, add the rest of the water and boil. Add, when cooling, 8oz. chlorate of potash, and when nearly cold, the following solution:—12oz. of aniline of commerce, 54oz. by measure of solution of sesquichloride of chromium at 50deg. of Twaddell's hydrometer; heat at 100deg. Fah. until all the aniline has dissolved, mix well and strain, and it is then ready for printing with. is then ready for printing with.

A good printing black can also be made with the disulphocyanide paste and the ordinary chloride of aniline of commerce, in which case proceed as follows:—One gallon of water, 11lb. of starch; beat up with a little of the water, and add 11oz. of disulphocyanide paste. When this is beaten up add the rest of the water and boil. When cooling add 80s. of chlorate of potash, and when nearly

cold 16oz. of chloride of aniline of commerce in crystals or cake; strain through a cloth, and the colour is ready for printing.

### ON VENTILATION.\* By Dr. EDWARD SMITH, F.R.S. PART 1 .- GENERAL PRINCIPLES.

AM quite aware that there are many persons who seek to increase and on the subject of this paper, whilst there are others who know nothing about it, and who care nothing, so long as they are not interfered with, and others still who regard it as a fashionable folly of the day, but a necessary evil. There are not a few who attach sufficient importance to it to invent a method of ventilation; and I fear that it may be said that there are nearly as many views on the subject as there are advocates of it, so that, in the discussion of this evening, we shall, doubtless, be all of one mind.

It cannot be denied that, of late years, increased attention has been given to the ventilation of public buildings, and that improvements have really effected; but the subject is still novel and in both its theory and practice calls for more accurate and extended information than we possess. We might, therefore, to-night profitably consider any of the several divisions of the subject, such as the abstract principles involved in the movement of the air, the ills which follow deficiency or excess of ventilation, the numerous methods by which architects and others are groping their way with much blundering to a satisfactory result, or specific directions as to the ventilation of each kind of public and private building.

My own experience, official and otherwise, leads me to think that a discussion of a practical nature upon two of these divisions, would be the most useful at the present time, but as they are too extensive for one paper, I purpose to consider only one of them to-night. Those persons who ventilate our public buildings have, I think, a tolerably correct opinion of some of the more obvious principles of the science, but they fail in not duly weighing the limitation of those principles in practice, and thus fall into error. Hence I think it will be useful to attempt to correct these errors, by considering, in a brief manner, some of the principles involved in the science of ventilation, with the methods at present in use, and the conclusions at which I have arrived. The second part, to which I have referred, is the practical consideration of the existing modes of ventilating our private and public buildings, and the plans of construction which are required for different classes of buildings, in order to render them healthy and fitted for their purpose; and this must be deferred to another occasion.

The essential part of ventilation is movement of the air from a particular place. It follows that when a portion of air has been removed from a part of a room, another portion will rush in, and, although it is usually implied that the removed air is less pure than the new supply, this is not a necessary consequence; since ventilation is required even in the open air, and in masses of air of equal purity. No ventilation can be effected without movement of the air, but with the movement other actions follow; and so important are they that movement may be beneficial even when the new supply shall be less pure than the removed air. The regulation of the movement of the air is, therefore, the basis of the practice of ventilation, whilst the character of the new supply is an element which demands careful attention.

The necessity for movement of the air is based upon the requirements of the body and the consti-The body must rid itself of tution of a mass of air. heat and moisture, and of certain noxious and offensive products; the two first chiefly by the skin, the third chiefly by the lungs, and the fourth by various organs. As to heat, the body is warmed various organs. As to heat, the body is warmed chiefly from within by the changes which the food undergoes; and as, notwithstanding any excess in the supply of heat, it is maintained at about an uniform temperature, it follows that it must rid itself of superfluous heat by discharging it into the air. Air is, however, a bad conductor of heat, and when the excess of heat is considerable, the layer of air about the body cannot remove it with sufficient rapidity, but in proportion to the rapidity of the movement (other things being equal) will the heat be more or less rapidly dissipated.
What lady has not proved this by her fan? And in hot weather, or in a hot climate, how delightful it is to hold up the naked hand even, much more to

• Read before the Society of Arts.

expose a large part of the body to the punkah or the breeze. This, it will be observed, is not a question of air at different temperatures, but with air at the same temperature; we may feel hot when the air is stagnant, and cool when it is in rapid motion. Yet, in certain conditions, and in a degree, cooling of the body may be attended with cooling of the air, for it is chiefly effected by the sudden conversion of the fluids of the body into vapour by perspiration and respiration, from which an immense amount of heat becomes latent, viz., loses its sensible effect upon the thermometer, for the latent heat of vapour is about 1,000 times greater than that of fluid. The abstraction of this heat occurs near the surface of the body, and the air in contact with the body and the body itself may become cooler. Hence the body is cooled both by contact with the air, or by transmission of heat, and by evaporation of fluid, or the absorption of heat, and for both processes movement of the air is necessary. The moisture which is emitted from the body is absorbed by the air, but the capacity of the air to absorb moisture is limited, and at a low temperature is soon exhausted. Hence, as one layer of air loses its capacity, there is need for movement to bring a new supply.

But besides these two operations, the sense of comfort and the state of the spirits, and thence of the health, require movement of the air. enter a large room which has been shut up for a long time, and with a sniff of the air you remark its want of freshness. If you stay in it you feel low spirited and unhappy, and yawning, with or without headache, will follow; but introduce a punkah, or adopt any mode by which the air is set in motion, and some sense of relief will follow. So much for the body. But the air itself, in order to keep it somewhat uniform in character and fitted to maintain behaviors.

and fitted to maintain health, must be in motion.

A closed house is generally a damp house. The lower stratum of the atmosphere holds more moisture than the higher. The air surrounding living bodies receives contamination, as it also generally does when in contact with the works of man; and the sewage system and the gas light system of our day do not a little to foul the atmophere. But this applies to a limited portion of the atmosphere, and when the air is in motion other portions not thus tainted are supplied, whilst the contaminating matters become less and less noxious or disagreeable as they mix with the larger volume of purer air, until they are no longer perceptible or efficient for evil. This applies not only to spaces enclosed by four walls, but in some degree to our courts and alleys and even to our streets and towns, for it has been shown by Dr. Angus Smith, Professor Roscoe, and others, that such places, being confined, have the air more contaminated than that in the fields, or on the top of a mountain. Hence we need ventilation to drive the air of rooms into the courts, of the courts into streets, and of the streets into the country, and to draw to us the air the good qualities of which our country friends do not always fully appreciate.

Movement of the air is of two kinds; one always quiet, by the interchange of gases, a physical property which is essential to air and all gaseous fluids by which gases of different kinds mix together, and if enclosed acquire one composition. A whiff of tobacco-smoke, or a jet of vapour of eau de Cologne may be seen or smelt for a moment in a certain spot only, but in a short time, as we know, it extends and impregnates the whole air within certain limits. This is constant, continuous, and without observation, and is of the utmost value in ventilation. It moreover acts in all directions, and is limited only by the amount of the matter to be distributed, and by the enclosure of the whole volume of air. Without this influence the exposure of the body to foul and noxious agents would render life miserable, and in the end would destroy it. How soon would the bedhead, for example, be a reservoir of deadly gases.

The second kind of movement is due to influences acting from without, a body of air. The winds are the great ventilating agents, and their influence penetrates wherever the external air can gain access, but their influence varies with their force and direction, and the obstacles which walls and other impediments offer to the movement of air. Their action must be the basis of any large system of ventilation, and in my opinion they must under nearly all circumstances, be the chief acents.

Similar effects, but more limited in degree, follow mechanical contrivances. The punkah in hot climates, is an illustration, but in this climate the mechanical contrivances. movement of persons in a given space is the most frequent agent, and when we limit our observation to a room, the movement of persons through it and within it, is not by any means without effect. The currents which occur with open doors and windows are due to the movement of the external air in so far as they result from this mechanical action only, for narrowing an aperture in a stagnant room does not produce a current as it would were the air in motion.

The third important cause of motion is that of heat. Air expands 1-480th of its bulk for every degree of heat, Fah., above 328, and, consequently, if we take an ordinary-sized room (say 20ft. long by 12ft. wide, and 10ft. high) there would be an expansion of 5ft. for each additional degree of heat, or a practical loss of 60ft., equal to a layer 3in. deep ever the whole room with or increase of 13te. over the whole room, with an increase of 12deg, of heat. This would be equal to lowering the height of the room from 10ft. to 9\frac{3}{4}ft.—assuming, of course, that no fresh air at the lower temperature were admitted. An essential condition of this change is that the heated air ascends, since it is lighter, and there are currents moving upwards, whilst, at the same time, the air which is colder descends and causes descending and lateral waves or currents until the whole mass has attained an uniform degree of temperature. Every person, and every light in a room, is a cause of these currents, and the room in which we are now assembled is full of them. As the total volume of air increases, it follows that some must escape (unseed to the court of the court o less we assume the room to be air-tight, when, with expansion of the air from heat, there will be condensation from pressure), and this will occur at the top of the room if there be openings, or at the sides, or even at the bottom if there be no other mode of escape. When the air becomes cooler it condenses in volume, and more air is admitted by descending or lateral currents into the room.

With elevation of temperature certain other conditions occur, which have great importance.

The power to cool the body by contact is

lessened.

The air is capable of absorbing a larger amount of moisture, and is relatively drier, until the increased quantity has been supplied.

The skin is rendered more sensitive to cold, and the tendency to perspiration, by which the heat of the body is removed, is increased.

Above a certain degree there is a tendency to exhaustion of nervous power and relaxation of tissues which render an individual less capable of mental and bodily labour; lassitude, low spirits, headache, and indisposition to make any effort, are well-known results of occupying a close and hot room.

(To be continued.)

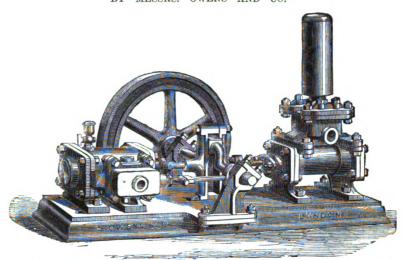
# PROPOSED EXHIBITION AT UTRECHT.

PROPOSED EXHIBITION AT UTRECHT.

An International Exhibition is to be held at Utrecht in August, September, and October next. Its principal object is to improve the condition of the working classes by bringing together articles of household use, furniture, dress, food, and the like, of various countries, at prices combining usefulness with solidity. The place of exhibition in the Netherlands has been changed from Utrecht to Amsterdam, where the exhibition can be conducted on a larger scale, in a building already in existence, specially adapted for exhibitions, and similar in design to the Crystal Palace. The jury for the exhibition will be appointed by the King of the Netherlands, and it will be conducted by a central committee at Amsterdam, of which Baron Mackay is at the head. The Dutch railway between Rotterdam and Amsterdam will carry goods forwards and backwards free of all charges. Within the last few weeks, Mr. P. L. Simmonds, who has had much experience in exhibitions, has, at the request of the London Committee, visited Manchester, Birmingham, Wolverhampton, the Potteries, Bolton, Sheffield, and Nottingham, with a view to ascertain to what extent the manufacturers there would be prepared to join in the exhibition, and, at a recent meeting at the Mansion House, he reported the results of his inquiries. As a rule, such of the manufacturers as are disposed to send goods to the exhibition have an objection to affix the wholesale prices to them, and have few means of knowing the retail prices. The committee thought that a reasonable objection, but were of opinion that it was essential the retail prices should be affixed, so far as those could be ascertained. Eventually, Mr. Simmonds was instructed to put himself in communication with the Central Committee in Amsterdam on matters of detail, and, before the meeting separated, a public subscription was set on foot towards carrying out the English part of the exhibition, the Lord Mayor, as a beginning, contributing £10 10s.; Mr. Samuel Morley, M. P., £25; and t

# STEAM PUMPING ENGINE.

BY MESSRS. OWENS AND CO.



BOATS IN THE NAVY.

ONE of the most important parts of the equipment of a ship of war is undoubtedly her boats and their capabilities. In this respect, the ships of the English navy, a few years since, were far behind those of France or Russia, but at the present time, owing, it must be admitted, to the exertions of the Controller and Chief Constructor of the Navy, they are much more efficiently provided in that respect than the ships of any other nation. For some time after steam-power was applied for the propulsion after steam-power was applied for the propulsion of boats attached to ships of the French and Russian navies, our own authorities stood by oars and sails, and when they did follow on the new track it was only done at first in a compromising and bungling kind of way. In their application of steam-power to boats, our friends aimed at rendering the boat a kind of miniature despatch tender to the ship, possessing as much speed as could be given by the engine and boiler carrying power of her tonnage, without the usual heavy gun at the bow or stern, and with no great capacity for stowage beyond fuel, but with good towing powers, so that she could take a string of heavily armed boats into or out of any position that might be desired on a coast at a moderate speed. Our first efforts in the same direction was to place twin-screw engines and boilers in the heavy built steam launches already attached to our ships, retaining them at the same time in all their original form as gun-carrying boats, with armed crews, and stores of shot, shell, mast, sails, oars, water, and provisions, &c., the clumsy bluffbowed monsters being, when thus loaded, scarcely able to hold their way against a moderate wind or tide in a river way, and useless altogether for towing purposes. The fitting out of two surveying sloops for service in the Chinese and Japanese seas led to the introduction of quite a different class of steamboat into our navy, a type of boat which more nearly approached that adopted in the French and Russian navies in its general principles as simply a despatch and towing boat, but excelling them greatly in having superior speed, combined with the lifeboat principle in the boat's construction, the latter arrangement rendering them unsinkable when filled with water to the gunwale's construction, the latter arrangement rendering them unsinkable when filled with water to the gunwale's construction, the latter arrangement rendering them unsinkable when filled with water to the gunwale's construction, the latter arrangement renderi of boats attached to ships of the French and Russian navies, our own authorities stood by oars and sails, and when they did follow on the new track it was

immersion of the upper edge of 2in. The mean revolutions of the engines were 244-63, and the boat's mean speed was 7.988 knots per hour. No. 13 was tried at a draught of water 3ft. aft and 2ft. 5in. was tried at a draught of water 3ft. aft and 2ft. 5½in., a pitch of 3ft. 4in., a length of 4:in., and an immersion of the upper edge of 3½in. The mean revolutions of the engines were 282-66, and the boat's mean speed 7-288 knots per hour. No. 10 was tried at a draught of water 3ft. aft and 2ft. 8in. forward. Her four-bladed common screw had a diameter of 2ft. 9½in., a pitch of 4ft. 2in., a length of 6½in., and an immersion of the upper edge of 1½in. The mean revolutions of the engines were 249-5 and the boat's mean speed 8-040 knots were 249.5, and the boat's mean speed 8.040 knots per hour. It was boisterous weather when all the boats were tried over the measured mile. All four of the boats were very handsome and buoyant in their appearance when under full steam pressure in running over the measured mile.—" Times."

## STEAM PUMPING ENGINE.

THE very compact little engine, illustrated in the accompanying engraving, has been designed and constructed by Messrs. S. Owens and Co., of Whitefriars, to meet the existing demand for a really efficient and reliable donkey engine; and while no attempt has been made to compete in price with the many and various examples of donkey engines which are at the present time in the market, no pains have been spared to ensure thorough reliability of action, efficiency, and durability. In doing so, those parts of the steam engine which are generally admitted to be essential to its proper working have not been dispensed with, neither have the makers run into that extreme simplicity generally indulged in, the object being simplicity generally indulged in, the object being to produce a serviceable pump, at all times certain in action, at a reasonable cost. We recently visited Messrs. Owens' works, where we found one of these pumps working away in the most satisfactory manner. It had a  $4\frac{1}{2}$ -inch steam cylinder,  $2\frac{1}{4}$ -inch pump cylinder, 6-inch stroke, making 150 strokes per minute, and delivering over 1,200 gallons per hour. The chief novelty in the design of these machines is the arrangement of the valves of the pump, which from their peculiarity, cannot become set fast in working; and, as the valves and seatings are easily removable, they can be readily replaced by a new set, when they become defective by wear, and thus the pump may be restored to its original state of efficiency at a trifling expense. We need scarcely observe that one of the advantages of a double-acting pump is, that a continuous feed to a boiler is maintained, and a regular and constant delivery into a tank is effected, while the duty performed is just double that of a single-action pump of a corresponding size. Seeing several of these pumps in progress, we could not but observe that in their manufacture special attention and care is paid to the fitting and finish of every detailed part, the materials used being of the best quality. The bed plates are planed over their entire surface, the fly-wheels are turned up true on the rims, the cranks are made of wrought iron, both the steam and water cylinders are furnished with metallic pistons, and all the working parts of the pumps are made of the best gun metal. On the whole, we are favourably impressed with Messrs. Owens' latest novelty in the feed pump line, some of which, we may add, are out and doing good

MIDLAND BOILER ASSURANCE COMPANY. HE fourteenth half-yearly meeting of the above association was held last month, when Mr. E. B. Marten presented his report, from which we gather that up to December 31, 1868, there were 2,633 boilers under the care of the company. Only one serious explosion occurred during the year 1868 to any boiler under the company's care, and even this one exploded while the fire was being drawn, in one exploded while the fire was being drawn, in order to execute repair, reported necessary by the company's officers. One or two injuries scarcely to be called explosions have taken place, owing to shortness of water, and when the boilers were under assurance they have been reinstated. During the past year, each of the boilers under the care of the company has been seen at least four times, and more than half the number have been seen inside and in the flues. Many instances might be given where the written reports, sent to owners, have led to the repair or renewal of old or unsafe boilers. Attention has been given to the prevention of smoke with considerable success. Engines continue to be examined with the indicator, with useful results. The company's officers continue to obtain records of with considerable success. Engines continue to be examined with the indicator, with useful results. The company's officers continue to obtain records of boiler explosions, by personal examination of the remains, in order to ascertain what evils to guard against to insure the safety of boilers. Records are given of 45 explosions, by which 57 persons were killed, and 71 injured. The most fatal expiosions have been at iron works, because the boilers stood in the midst of the workmen. The boilers which most frequently exploded were those internally fired, chiefly owing to the want of strengthening rings on the tubes, now proved necessary. Many externally fired boilers exploded because worked for 30 years and more, and so frequently repaired as to make it impossible to estimate their remaining strength. The most frequent cause of explosion has been faulty construction with imperfect material or workmanship, or insufficient stays, but corrosion has also, as usual, been the direct cause of many explosions. The officers of this company have now considerable experience in their psculiar duties, and, knowing where to look for it, are often able to detect mischief and prevent explosion. At the end of the year 1868, 1,103 boilers were under inspection, and 1,530 under assurance, making a total of 2,633, as given above. These boilers were used for the following purposes—1,238 in collieries, 1,156 in iron works. year 1868, 1,103 boilers were under inspection, and 1,530 under assurance, making a total of 2,633, as given above. These boilers were used for the following purposes—1,238 in collieries, 1,156 in iron works, and 239 in mills of various kinds. The boilers were of the following general description:—2,205 fired externally, and 428 fired internally. During the year there have been made 11,900 inspections of boilers, 1,483 of which have been internal, and 1,361 in the flues, and 1,656 reports have been sent to the owners. flues, and 1,656 reports have been sent to the owners.

#### LONDON ASSOCIATION OF FOREMEN ENGINEERS.

ENGINEERS.

IT has been definitely arranged that in future the monthly meetings of this institution shall be held at the City Terminus Hotel, Cannon-street. The first sitting at that place is appointed for Saturday, April 3, at eight p.m., and it will be followed by others regularly throughout the year on the first Saturday in each month, at the same hour. It was expected that Professor Tyndall would have read a paper on the 3rd proximo, but he has, unfortunately, been obliged to postpone it for the present. Under these circumstances, the president, Mr. Newton, of the Mint, will deliver an address having relation to the opening of the new assembly room; and Mr. Robert B. Vinicombe will read a paper on gunpowder machinery, at the April meeting. It is hoped that members, both honorary and ordinary, will attend in large numbers, and will also use freely their privilege of inviting friends interested in the progress of engineering science to be present at this and all other sittings of the Association. The committee are exceedingly anxious that the proceedings of the associated foremen should be shared in by representatives of every class and every department of the engineering profession, so as to widen the influence and increase the value of the institution as much as possible. The newly-acquired assembly room is spacious and well appointed, and in all ways calculated to conduce to the advancement of the society. All that is further essential is the active co-operation of the engineering community generally It may be mentioned that, according to the original and unaltered rules of the Association, employers of engineering labour are admitted to any or all of its meetings on the presentation of their cards, although they may not be enrolled as honorary members. They are, however, always welcome visitors. TT has been definitely arranged that in future the

# DIVIDING AND GEAR CUTTING MACHINERY.\*

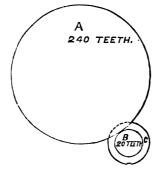
GREAT deal of time, money, ingenuity, and nice A workmanship have been expended in the production of machinery for dividing the circle into equal parts. Among the early productions of this class was that of Jesse Ramsden, an intelligent mechanist, who, about one hundred years ago, was

\* " F. G. W," in the American Railway Times.

employed by the Commissioners of Longitude in dividing the arcs of sextants, and quadrants, and instructing others in the use of his machine. His machine consisted of a large bell-metal dividing wheel, containing 2,160 teeth in its periphery, in which a steel worm worked. In its details this machine was quite elaborate and complex, and required chine was quite elaborate and complex, and required much painstaking and ingenuity in its construction. Some of the gear cutting machines of the present time work with a worm, upon the same principle of the Ramsden machine. The chief objection to the worm machine is, great wear of the worm and teeth of the wheel; the worm often requires to be revolved many times for each tooth that is cut.

The machine most extensively used for cutting gears is that with a perforated wheel. The perforations are made with a drill in concentric circles on the face of the wheel, and it requires the most careful and skilful manipulation to fit up and perforations. forate these wheels; and then it requires great care in the use of this machine in setting the steel point in the use of this machine in setting the steel point in the perforations, otherwise the holes will, in time, become so worn as to cause imperfect work. The operator should be careful and not let the point down until the hole is exactly beneath the point, else there will be a tendency to wear the holes on

All things considered, the machine that works with All things considered, the machine that works with gear and pinion is the most serviceable and the most expeditions in operation. I have noticed that most of the new machines made in Worcester are of this class. The dividing part of this machine consists of a gear wheel, A; the pinion, B; and auxiliary wheel, C. The main wheel, A, may contain any number of teeth that is an exact multiple of some smaller numbers, and may be of any diameter proportionate to the size of the machine required. A multiple of 12 and a diameter of from 2 ft. to 4 ft. are the proportions adopted here by mechinists ft. are the proportions adopted here by machinists. The number of teeth in the main wheel,  $\Lambda$ , must be exactly divisible by the number of teeth in the pinion, without a remainder. A number of auxiliary wheels, C, are required in order to produce the great



variety of divisions required by the these wheels are made exactly alike in diameter and thickness, and are interchangeable, so as to be used, these wheels are made exactly alike in diameter and thickness, and are interchangeable, so as to be used, one at a time, in connection with the pinion, B. They must be so connected to the pinion as to revolve with it, without the possibility of the least slip. These wheels are divided, on their periphery, into various numbers of equal parts (no two alike), by notches deep enough to engage a pawl, by which the wheel is turned. Now, if the main wheel, A, contains 240 teeth, it is evident that any number which divides 240 without a remaider, may be produced without the use of the pinion and auxiliary wheels, as 2, 3, 4, 5, 6, 8, 10, 12, 15, 10, 20, 24, 30, 40, 48, 60, 80, 120, and 240. But it is for the production of the intervening numbers that the agency of the pinion and auxiliaries are required. If, for instance, a wheel with 27 teeth is wanted, it is evident that the main wheel, A, must be moved 1-27th of a revolution for each tooth; hence the auxiliary must contain such a number of notches or divisions as will produce this result by moving and setting it 27 times; therefore, the auxiliary wheel, C, contains 27 teeth, or some number that is a multiple or measure of 27, as 9, 54.

A rule which can be easily remembered for answering all each may be eastly them.

A rule which can be easily remembered for answering all cases may be stated thus:—Divide the number of teeth in the main wheel, A, by the number of teeth in the main wheel, A, by the number of teeth in the pinion, B, and use the quotient as a numerator of a fraction, the denominator of which is the number of teeth required to be cut. This fraction will express the motion to be given to the pinion for each tooth. Applying this rule to the case in hand, we have 240 divided by 20 equal 12: then as 27 is the number of teeth to be cut, 12-27 of a revolution of the pinion is required for each tooth; this fraction reduced equals 4-9; hence, if the auxiliary contains 9 notches, four of them must be taken in each movement for a tooth; if it contains 27 notches, 12 of them must be used for each tooth; if it contains 54 teeth, 24 of them mus be taken for each tooth. &c. If 360 teeth or divisions are wanted, 12-360 or 1-30th of a revolution of the pinion will be necessary for each tooth or division; hence an auxiliary wheel with thirty notches or divisions will be needed, or such a number as can  $\Lambda$  rule which can be easily remembered for answer-

the ones they are calculated for. The one with 30 notches, for instance, may be used for 180, 120, 72, 60, &c., and many more.

#### STEAM v. HORSE POWER.

A T the last monthly meeting of the Highland and Agricultural Society, the subject for discussion was the comparative advantages and cost of steam and horse power or hand labour—1. With reference to the working of land in a high state of cultivation; and 2. With reference to improvable land. The president, the Marquis of Tweeddale, opened the discussion by reading a paper, in which he detailed his experience in the cultivation of his farm of Yester. He tried ploughing with ordinary ploughs drawn by horses, then ploughs of his own invention in which the mould-board was convex, instead of the old-fashioned concave mould-board. He next tried oxen in drawing the ploughs, but they were too slow, and the shape of their feet unfitted them for walking on the pulverized soil. He also tried steampower, but the stones caused breakages, and any contrivance to disengage the power of steam for the machinery when it met an obstacle proved a failure. The noble president also gave his experience as to his cultivation of the farm of Newall, and on T the last monthly meeting of the Highland and fine machine.

The noble president also gave insexperiones as to his cultivation of the farm of Newall, and on the whole he found horse-power best suited in the machine of his land; and ploughing with a pair the whole he found horse-power pest suited in the improvement of his land; and ploughing with a pair of horses from 12in. to 18in, deep cost him 12s, per acre, or using three horses to the plough it cost him 14s, 5d, per acre. Mr. George Hope, Fentonbarns, spoke highly of the noble president's paper, and stated that it was the first time in his experience that he had heard a president of their security give a and stated that it was the first time in his experience that he had heard a president of their society give a sound and practical lesson to agriculturists. He then proceeded to read a paper, in which he related his experience in cultivating his farm with horse and steam-power. He spoke most favourably of steam-power, by means of which every acre of his farm had been cultivated to his wish, and every crop had been sown in good time, which all practical men knew to be of creat importance in a necuniary crop had been sown in good time, which all practical men knew to be of great importance in a pecuniary point of view. The cost of steam ploughing was 8s. 0½d, per acre, and 6s. 4d, per acre for grubbing, Mr. Greig, Kincardine, spoke in favour of the steam cultivator, and read a great number of letters from farmers in Kincardineshire, who stated that by the use of the steam plough better crops had been obtained, and the subsoil loosened and broken up without being brought to the surface, which could not be done with horse-power. not be done with horse-power.

# Mogal Intelligence.

ROLLS COURT. . March 24. (Before the Master of the Rolls.)

CROSSLEY V. DIXON.
THIS suit was instituted by the firm of John Crossley and Sons, now Crossley and Sons (Limited), the well-known carpet manufacturers (Limited), the well-known carpet manufacturers of Halifax, in order to obtain a declaration that the Dixons, who are carpet manufacturers at Kidderminster, are liable to pay a royalty on certain looms worked by them, and obtained from the plaintiffs, for a period of about a year prior to the 6th of Daganher 1866 during which period the 9th of December, 1866, during which period any of the improvements incorporated in the looms were protected by patents belonging to the plaintiff. The patents in question, the last of which expired on the 9th of December, 1866, were two of a person named Johnson, which bore date March 8, 1852, and December 7, 1852, and also two of a person named Collins, which bore date October 1, 1852, and December 9, 1852, for improvements in the manufacture of Brussels and velvet pile carpets. The defendants' answer to the suit was that in a former suit of "Crossley v. the suit was that in a former suit of "Crossley v. Dixon" it had been ascertained and determined what patents were then subsisting and worked by the defendants, and that these patents had all expired by the time when the present suit was instituted, and that the investigations made in the former suit, and confirmed by the Chief Clerk's certificate, showed that what was included in the looms sold to the defendants did not include the patents which were now insisted upon by the plaintiffs; and, secondly, if the first contention failed, then that the looms did not invade the inventions contained in and protected by the plaintiffs' patents.
Mr. Grove, Q.C., Sir Richard Baggallay, Q.C.,

and Mr. Cracknall appeared for the plaintiffs; and Sir Roundell Palmer, Q.C., Mr. Jessel, Q.C., Mr. Speed, and Mr. Theodore Aston for the de-

His LORDSHIP thought that the former suit did not dispose of the question. The point at issue in that case was whether certain machines of Messrs. division: nence an auxinary wheelwith thirty notenes or divisions will be needed, or such a number as can be measured by 30, as 60, 90, &c. These auxiliary Sharp, Stewart, and Co., which were sold to the wheels are applicable to many other numbers than defendant Dixon, included any of John Crossley

and Son's patented inventions. It was true that the plaintiffs were the same, and the Dixons were defendants, but they had no interest in the matter, which was, in truth, solely a contest be-tween John Crossley and Sons and Sharp, Stewart, and Co., and the latter firm defended the suit from first to last. Accordingly, though the two in-quiries were nominally the same, they were so only as between Crossley and Sharp, the first being what inventions were included in and protected by Crossley's patents, and the second which of the inventions, if any, were made use of in Sharp's machines. The real question at issue in the present suit was only a collateral one, and was not pursued in the former suit; and his Lordship was, therefore, of opinion that the second question did arise, and that it was his duty to determine whether the looms supplied to the defendant Dixon did include the said patent, or any and which of them. His Lordship had permitted the originate correctly and found himself. rused the evidence carefully, and found himself unable to determine this question without seeing the machines, and having them explained to him by gentlemen conversant with the matter. If the parties would consent to be bound by his opinion, after examining the machine and having the matter explained to him by two gentlemen, one on each side, he would determine it. If not, he should send an issue to a jury, who should decide whether any, and, if any, which of the inventions protected by the patents was included in the machines supplied by the plaintiffs to the defendants

# PANAMA HATS-WHAT THEY ARE MADE FROM, AND HOW.

MADE FROM, AND HOW.

THE screw pines are natives of tropical regions; are abundant in the islands of the Indian Archipelago, and in most of the tropical islands of the Old World, but rare in America; the section Cyclanthese, on the contrary, being exclusively confined to that continent. This order is divided into two sections, the first of which called Pandanse, and the second Cyclanthese. Each of the sections contain several genera, some of which contain several species. The Carludovica is a small genus of the second section of the order. Of this genus the species called by botanists Carludovica Palmata, is the most valuable and interesting; it is the plant from whose leaves the celebrated Panama hats are made. Dr. Seeman, a celebrated South American traveler, states that the

Interesting; it is the plant from whose leaves the celebrated Panama hats are made. Dr. Seeman, a celebrated South American traveler, states that the leaves of this plant are from 6ft. to 14ft. high, and their lamina about 4ft. across. In the Isthmus the plant is called Portorico, and also Jipijapa, but the last name is the most common, and is diffused all along the coast as far as Peru and Chill; while in Ecuador a whole district derives its name from it.

The Jipijapa is common in Panama and Darien, especially in half shady places; but its geographical range is by no means confined to them. It is found all along the western shores of New Grenada and Ecuador; and it has been found even at Salango, where, however, it seems to reach its most southern limit, thus extending over 12deg, of latitude from the tenth N. to the second S. The Jipijapa, or Panama hats, are principally manufactured in Veraguas and Western Panama; not all, however, known in commerce by that name are plaited in the Isthmus; by far the greater proportion is made at

Pannam hats, are principally manufactured in Veraguas and Western Pannam; not all, however, known in commerce by that name are plaited in the Ishmus; by far the greater proportion is made at Manta, Monte Christi, and other parts of Ecuador. The hats are worn almost in the whole American, Continent and the West Indies, and would probably be equally used in Europe, did not their high price varying from 2 to 150 dollars, prevent their importation. They 2 no distinguished from all others by consisting or single piece, and by their lighting that the property of the property protected. The process of making these plants is as follows:

The process of making these basts is as follows:

The process of making these plants is as follows:

The process of making these plants is as follows:

The process of the leaf, is reduced to shreed. All their ribs and construction of the property protected. To keep a guident of the property of the property protected. To keep a guident of the Amstrong type, or even the recoil of the property of the

months. The best times for plaiting are the morning hours and the rainy season, when the air is moist; in the middle of the day and in dry, clear weather, the straw is apt to break, which, when the weather, the straw is apt to break, which, when the hat is finished, is betrayed by knots, and much diminishes the value.—"Scientific American."

#### TO CORRESPONDENTS.

THE MECHANICS' MAGASINE is sent post-free to subscribers of £1 is. 8d, yearly, or 10s. 10d, half-yearly, payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGASINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompassed by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. ED. M. M.

Advertisements are inserted in the MECHANICS' MAGA-

faith. Ed. M. M.
Advertisements are inserted in the MECHANICS' MAGA-SINE, at the rate of 6d, per line, or 5d, per line for 13 inser-tions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise-ments.

# Meetings for the Meek.

MON .- Royal Institution .- General Monthly Meeting, at

Mon.—Royal Institution.—General Monthly Meeting, at 2 p.m.

Society of Engineers.—Mr. W. F. Hartley on "The Methods Employed in the Determination of the Commercial Value and Purity of Coal Gas," at 7.30 p.m.

Royal United Service Institution.—Mr. Charles F. Henwood, Naval Architect, on "The Conversion of our Wooden Line-of-Battle Ships into Armoured Turret-Ships," at 8.30 p.m.

TUBS.—Royal Institution.—Professor Grant on "Stellar Astronomy," at 3 p.m.

The Institution of Civil Engineers.—Continued Discussion on "American Locomotives and Rolling Stock," at 8 p.m.

THURS.—Royal Institution.—Professor Tyndall on "Light," at 3 p.m.

FBL.—Royal Institution.—Mr. B. Carpenter, M.D., on "The Temperature and Animal Life of the Deep Sea," at 8 p.m.

Royal United Service Institution.—Mr. A. B. Lord, h-p. R.A., on "Hints to all who Travel," at 3 p.m.

SAT.—Royal Institution.—Mr. A. Geikie on "The Origin of Land Surfaces," at 3 p.m.

# Correspondence.

## HORSE POWER.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—When Watt gave us a nominal measure of power, he invented a very good standard—one that defied steam horse dealers to sell an engine for more than its real commercial value. The calculation was simple, and answered, and answers yet the purpose for which it was framed, namely, that the purchaser could not mistake in buying his engine, and that the dealer rested satisfied that he had given the value for money received. I am sorry to see that some advocate an entirely new method, namely, an indicated measure, or a foot-pound standard, for commercial transactions. This measure is advanced, I am happy to say, by non-manufacturers. Were it introduced, what would follow? Simply this: that a certain size of cylinder, length of stroke, &c., &c., could be sold for a variety of powers. The first, we will say, the real value of the machine, the steam, is cut off at one quarter of the stroke. Cutting off at three quarters of the stroke, the power is greatly increased, and consequently a much larger sum would be demanded for the engine. I am merely treating with those dealers who sell engines independently from the boiler. It is quite clear that such a system is not a fair measure. If there is any alteration required, it simply consists in fairly fixing a higher steam standard and raising the engine to

of life I am thoroughly convinced that many good suggestions have emanated from civilians as regards suggestions have emanated from civilians as regards modern artillery. I, therefore, beg leave, through your magazine, to place before the authorities and the general public my opinion that the time has come when we must house our guns, and likewise introduce a very different mode of defence. Some time back, you gave my description of a floating dock and battery combined. Since then, I have considered the practicability of land forts on the same principle, namely, presenting the smallest point of attack by the end-on mode of warfare. My original idea showed a fort constructed of stonepoint of attack by the end-on mode of warfare. My original idea showed a fort constructed of stone-work protected with iron plating, covered over with a bank of earthwork. This would be somewhat expensive; but I consider such a fort formed internally with strong brick arches, covered entirely with a deep mound of earth, and strongly protected at the embrasures only, is not only the strongest structure that can be made, but likewise the cheapest. cheapest.

cheapest.

It may be asked, why do I not put my ideas before the proper authorities? My answer is, as I stated before, I am no soldier, and I prefer to state my opinion boldly and openly through the press of the profession. We have long since passed the time when such ideas can remain for any length of time secrets; conservatism on such subjects has become a dead letter. And, in conclusion, I should feel obliged if any of your military readers would discuss this subject through your paper; and, Sir, I am confident that they will come to the conclusion that such a peaceful tilt of arms constitutes England's strength.—I am, Sir, yours, &c.,

JOHN G. WINTON.

13, Gladstone-street, March 23.

13, Gladstone-street, March 23.

# Habal, Military, and Gunnety Items.

THE death, at Passy, is announced of General Jomini, the well-known writer on military tactics, at the advanced age of 90.

IT is rumoured that Major-General Simmons, C.B. Royal Engineers, has been selected to fill the appointment of Lieutenant-Governor of the Royal Military Academy, Woolwich.

THE new steamer, "City of Brooklyn," on her arrival at New York from Liverpool, was voted a suit of colours by the Brooklyn City Government, in honour of her name.

THE French army has just lost one of its most gallant officers by the death, after only two or three days' illness, of General O'Malley. He was the son of one of the Irish emigrants of '98, who entered the French service under the Consulate. The late General was in his 75th year.

The report of the committee on the contracts with the Cunard Company and the Imman Steamship Company, for the conveyance of mails to North America, was presented to the House of Commons on Tuesday week. It condemns the arrangement, but suggests that it should be continued, though for shorter tarm of variety than that represed by the a shorter term of years than that proposed by the agreement as it now stands.

According to the last statement issued by the Bureau ACCORDING to the last statement issued by the Dureau Veritas of Paris, the number of ships reported as totally lost in the month of February last is 238, of which 115 were English, 24 French, 22 American, 19 Italian, 15 North German, 6 Danish, 6 Spanish, and 31 of various other nationalities. The number of total losses during the corresponding month of 1868 was 212; of 1867, 224; and of 1866, 268.



vessels are of the first rate, 2,400 tons and upwards; 37 of the second rate, 1,200 to 2,400 tons; 76 of the third rate, 600 to 1,200 tons; and 58 of the fourth rate, under 600 tons. Fifty-two of these vessels are ironcled, carrying 129 guns; 95 screw steamers, 938 guns; 28 paddlewheel steamers, 199 guns; and 31 sailing vessels, 477 guns. The European squadron has 5 ships; the Asiatic, 9; the North Atlantic, 6; the South Atlantic, 5; the North Pacific, 8; and the South Pacific, 6. vessels are of the first rate, 2,400 tons and upwards

THE 450-pounder American smooth-bore gun was fired on Wednesday against the Plymouth casemate at Shoeburyness; the English shot proving something superior to the American spherical projectiles. The vibration of the blows of these heavy jectiles. The vibration of the blows of these heavy shot produced such a flaking of the iron armour as would tend rapidly to the disintegration of even this thick structure of solid iron. Colonel Shaw's muzzle-pivoting carriage for the 18-ton Fraser rifled gun was also further successfully tested with 13 rounds of 400-pounder shot fired with 60lb. charges. Want of space compels us to defer details of these experiments until next week.

# Miscellanea.

THE works of the railway between Athens and the Pirmus are now nearly completed, and will pro-bably be opened for traffic early in the present month.

SAN FRANCISCO is in a fever of excitement at present, over the gold discoveries, at the White Pine Mines. Fifty-six companies have been organized in that city since the lat of March to work leads in the White Pine region,

THE population of France, according to the "Bulletin des Lois," during the last five quinquennial periods, was as follows:—1846, 35,400,486; 1851, 35,783,206; 1856, 36,039,364; 1861, 87,382,225; and 1866, 38,067,094.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending March 27, was 5,377. Total number since the opening of the Museum, free daily (May 12, 1858), 1,527,444.

WE have to record the death of one of our oldest and most respected citizens, Mr. Thomas Brown, of Ludgate-hill. For many years he was a partner in the well-known firm of Messrs. Longman, Brown, Green, and Co., Paternoster-row, from which he retired some eight or nine years since.

A NEW regulation has just been issued by the trustees of the British Museum requiring that students frequenting the galleries, for the purpose of copying objects of art, natural history, &c., should on each visit inscribe their names in books provided to receive their signatures, and now placed in the entrance-hall of the institution with that view.

A roo whistle, recently erected on Cape Fourcher, A FOG whistie, recently erected on Cape Fourener, Yarmouth Harbour, Nova Scotia, is said to be the most powerful signal in North America, and can be heard fifteen miles in calm weather; in stormy weather, five to eight miles; with the wind, twenty-five miles; against the wind, five to eight miles. It has been heard inland with the wind twenty-five to thirty miles. thirty miles.

THE King of Bavaria has decided that there shall The King of Bavaria has decided that there shall be a universal Fine Art Exhibition held this year at Munich, in the Crystal Palace of that city; it is to take place after the closing of the Paris salon, in June, in order to give French artists an opportunity of presenting their works. The prestige of Munich in matters of artis expected to give additional interest to this exhibition. to this exhibition.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending March 27, 1869, wass—on Monday, Tuesday, and Saturday (free) from 10 a.m. to 10 p.m., 16,521; Meyrick and other galleries, 3,848; on Wednesday, and Thursday, cadmission 6d.), from 10 a.m. till 5 p.m., 1,430; Meyrick and other galleries, 1,815; total, 21,993. Average of corresponding week in former years, 11,070. Total from opening of Museum, 8,264,270.

WHILE the sexton of the parish church of Padstow While the sexton of the parish church of Padstow, Cornwall, was recently digging in the churchyard, he came upon an upright piece of granite, fixed in a piece of much larger size, which seemed to form the lower part of a very ancient piece of carved work. The footpiece was a large, flat, and irregular-sided granite stone, 8ft. long, and 5ft. wide, weighing nearly three tons. Padstow Church was built more than 1,000 years ago.

It is estimated that 1,000 persons are employed in Birmingham in the manufacture of pins, hair-pins, hooks, eyes, thimbles, and eyelets. Messrs. Edelsten and Williams alone use three tons of wire weekly in pinmaking, and Messrs. Eridge and Merrett, C. Iles, Phipson and Son, and other makers, would probably augment the total consumption of brass wire to 12 tons per week. At a moderate estimate, the number of pins manufactured weekly in Birmingham exceeds of pins manufactured weekly in Birmingham exceeds 200,000,000.

A LARGE number of gold English coins of the reigns of Edward III. and Henry VI., and French coins of the reigns of one of the Charles and Louis of France, the reigns of one of the Charles and Louis of France, were recently picked up at the Blackpool sands, near Dartmouth. They are nearly all in a good state of preservation. It is supposed that the coins formed part of a box of specie on board a vessel which had become a wreck in this locality, and that they became embedded in the sand, from which they have now been washed out. now been washed out.

MESSRS. MERRYWEATHER AND SONS have just forwarded from their works one of their celebrated Paxton fire engines to Tredegar Park, the seat of Lord Tredegar. The engine is handsomely finished, and upon each side of the panels of the horsebox is and upon each side of the panels of the horsebox is the coronet and monogram, and the words "Tredegar Park" in gold letters. The engine in question is similar to several recently supplied to the Metropolitan Fire Brigade, and is capable of discharging 100 gallons of water per minute, to a height of 120ft., two jets of water being projected through the delivery hoses simultaneously.

THE second term of 1869 of the South London Working Men's College, 91, Blackfriars-road, will begin on Monday next, when Sir John Lubbock, Bart., F.R.S., will preside at a general meeting of the members and friends of the college, at 8-30 p.m. The classes and schools will also reopen on the same day. Lectures will delivered, by Dr. Cobbold, F.R.S., on Monday, April 5, and by T. B. Payne, Esq., M.A., on Thursday, April 8. Among the new classes are, one in mechanics, under Mr. C. T. Mitchell, M.A.; one by Mr. A. D. Tyssen, B.A., in Greck history; and an advanced night school, under Mr. W. Rossiter, F.R.A.S. THE second term of 1869 of the South London

There seems little reason to doubt that the yield of Australasian gold is on the increase, this result being attributable to the discovery of several new fields. In 1868 we received Australasian gold to the value of £6,989,594, as compared with £5,801,207 in 1867, £6,839,674 in 1865, £5,051,170 in 1865, £2,636,971 in 1864, £5,995,368 in 1863, £6,704,753 in 1862, £6,331,225 in 1861, £6,719,000 in 1860, and £8,624,566 in 1859. It will be seen that the total receipts of Australasian gold for the 10 years ending 1868 inclusive were altogether £61,713,528, 1868 having made the largest yearly contribution to this aggregate, with the exception of 1859. THERE seems little reason to doubt that the

Two or three interesting discoveries have been made in the course of the excavations in the Briggate, Leeds. A pit dug out of the solid rock, to the depth of 22ft. was come at towards the end of last week by the workmen. It was filled with black soil of a rich character, and a large number of bones were disinterred from the bottom of the pit. bones were disinterred from the bottom of the pit. Some ancient specimens of crockery ware were also found in the pit, and are pronounced by good authorities to have been produced at least four centuries ago. They consist of three drinking cups and two lamps such as those formerly used by monks; a couple of antiquated looking pipes, and a key of somewhat peculiar workmanship, are amongst the other articles taken from the pit.

The imports of gold into the United Kingdom in January were on a comparatively restricted scale, having been £601,071 as compared with £2,117,760 in January, 1868, and £779,470 in January, 1867. In these totals the imports from Australasia figured for only £292,259 as compared with £410,092 in January, 1868, and £451,910 in January, 1867. The United States, which delivered to us gold to the value of £1,306,925 in January, 1868, only sent us £75,746 in January, 1869. The exports of gold from the United Kingdom amounted in January to £483,461 as compared with £1,578,070 in January, 1868, and £754,216 in January, 1867. In these totals the exports of gold to France figured for £214,773, £1,485,860, and £707,426 respectively. THE imports of gold into the United Kingdom

A LOCKSMITH, of Mulhouse, named Herrenschmidt claims to have discovered a mixture which is said to give to the commonest steel the grain and the to give to the commonest steel the grain and the temper of the finest cast metal, and, moreover, to have the power of bringing back the original quality of steel which has been burnt. The mixture is composed as follows:—With 16 litres of disis composed as follows:—With 16 litres of distilled water mix one kilogramme of hydrochloric acid, 19 grammes of nitric acid at 36deg., 21 grammes of sulphate of zinc, and 100 grammes of tripoli. In this mixture is to be placed a piece of cast iron of the first fusion, weighing 100 grammes; when the acid mixture has acted on the iron for 24 hours, the composition is ready for use in the ordinary way, and it remains effective till it is all mach.

THE project of establishing through the valley of the Garonne (France) a canal for large navigation to connect the ocean to the Mediterranean, has been to consect the ocean to the meditorranean, has been often mooted; but there is now a new plan for this undertaking, under the auspices of M. Staal de Magnoncourt, late peer of France. The proposed canal is to admit not only merchant ships of the heaviest toppes but also men of war and canal is to admit not only merchant ships of the heaviest tonnage, but also men of war and transatlantic steamers. A port is to be established in the Gironde, just below Bordeaux, and another on the Mediterranean. The cost of the scheme is estimated at 442,000,000f., and the cutting of

the canal would occupy six years. The plan, if carried out, will materially shorten the navigable communication between England, the North of Europe, and India, for it will, in fact, be a continuation of the Suez Canal.

# Patents for Jubentions.

## ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

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ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2876, 2878
SHIPS AND BOATS, including their fittings—2825, 2864, 2871, 2877
STEAM ENGINES—2831
WARFARE—2865, 2885, 2892

2804 B. GARDINER and T. H. FAULKNER, Bradford. Umbreilas and parasols. Dated September 11, 1868.

The patentees produce a new fabric suitable for covering the frames from the fibre known as china grass, by dyeing the grass in the state of fibre and afterwards weaving it into a fabric.—Patent abandoned.

weaving it into a fabric.—Patent abandoned.

2805 G. Bischop, Allee, Bonn, Prussia. Precipitation and separation of copper. Dated September 11, 1868.

The precipitation is effected in apparatus consisting of a large wooden cask suspended horizontally on axes supported in bearings on suitable standards. The cask has in its interior four or other number of longitudinal partitions extending radially from the circumference towards the centre. Spongy from and cupreous liquor having been introduced into the cask, an intimate mixture is effected without any caking of the contents by turning the cask slowly on its axis.—Patent completed.

2806 I. Roperts View Willey states E. G. Western

the cask slowly on its axis.—Patent completed.

2806 J. Roberts, King William-street, E.C. Horse shoes.
Dated September 11, 1868.
This consists in forming the outer part or case of a portable stove of two pieces of sheet metal of the same shape, but differing in size, the outer piece of metal being larger round than the inner piece, so as to leave space between the two pieces. The outer piece is formed perforated, and the inner piece solid, and the space between these two pieces is filled with loose or granulated terra-cotta or other similar suitable substance or material.—Patent completed.

2807 J. ROBERTS, King William-street, E.C. Horse shoes. Dated September 11, 1868.

The patentee employs a piece of leather or other material riveted to the turned up edges of a flat plate of sheet metal, and to this piece of metal an iron shoe of the ordinary kind is riveted or otherwise securely fixed.—Patent abandoned.

the ordinary kind is riveted or otherwise securely fixed.—Patent abandoned.

2808 G. Bowrr and W. Hollingshed, St. Neots. Gas engines. Dated September 11, 1868.

The engine consists of a framework carrying two cylinders placed diagonally, and at right angles to each other; these cylinders are arranged so as to oscillate on hollow trunnions, and both piston rods are attached to the same crank pin. On one side of each cylinder, and having the axis of oscillation passing through it, there is fitted a valve box with a cover and slide valve, and on the face of the cover of the valve box there is attached the hollow trunnion. The trunnion on the opposite side of the cylinder is attached direct to it. Each cylinder is provided with a jacket or outer case for the purpose of passing a stream of water round it to keep it cool. Within the hollow trunnions are fitted internal tubes or casings having compartments arranged in them; these internal tubes or casings are turned to fit accurately and truly the internal casings are held in position by a bracket and set serew bolted on to the framework of the engine, thus preventing them from oscillating or vibrating with the trunnions and cylinders. The explosion of the mixture of gas and air is effected at one end of each cylinder, only the down stroke being performed by the pressure of the atmosphers acting on a partial vacuum produced under the piston by the exploded gases.—Patent completed.



or other support for such article or matter, being connected with or formed on the arm. The other arm of the lever carries or is formed with a counterpoise. The lever or beam works or oscillates on the knife edge or edges, and it or its axis is connected with appliances which actuate a pointer travelling over a graduated dial to indicate the weight. When an article or matter to be weighted is placed in the tray or other support formed on or connected with one arm of the lever, the counterpoise arm swerves from the perpendicular, and by the arrangements in connection with it the lever or beam acts upon the property which indicates the weight on the dial pointer which indicates the weight on the dial. Patent completed.

2810 H. B. Woodcock, Low Moor. New manufacture of metal. Dated September 12, 1868.

This consists in the employment of steel bars in the puddling furnace during the process of puddling pig or refined metal into wrought iron. The steel bars are cut into small pieces, and their quantity or proportion varies from about 1-12th to 1-3rd in weight of the mass to be mixed, according to the purpose and degree of hardness and malleability required. The mass is then boiled, puddled, and worked together by the puddler in the ordinary process of puddling.—Patent completed.

2811 C. TURNER, Preston. Furnaces. Dated September 12, 1868.
This consists in perforating or forming apertures or holes in the front of the furnace plate above the doorway, which are capable of being closed by dampers or shutters, and through which, when open, a current of air is admitted, which is caused to strike or impinge against a "buffer" or inclined plate projecting from a point above the apertures into the furnace, terminating a few inches above the bars or grate, the dimensions of such bars longitudinally being reduced to about two-thirds the length of the ordinary firebars, the remaining one-third being built up with firebricks.—Patent abandoned.

2812 A. W. RODGER, Stewarton, N.B. Caps or bonnets.

2812 A. W. RODGER. Stewarton, N.B. Caps or bonnets. Dated September 12, 1868.

This consists in the insertion of a plece or pieces of elastic or other suitable expanding and contracting material at one or more places round the mouth, or that part of the cap or bonnet which fits the head.—Patent abandoned

doned.

2813 F. WARNER, Jewin-crescent, E.C. Wells and pumps.
Dated September 12, 1868.

The patentee bores or forms in the earth by means of an augur or other tool a hole, several inches in diameter, in the usual way. He lines the hole with a metal tube, as he proceeds, to prevent the sides of the hole falling in. He works in this way until the water-bearing stratum is arrived at, and he then puts down the suction pipe of the pump and draws up the outer tube out of the carth, so as to admit of the earth being closely rammed in around the upper part of the suction pipe. When the desired depth is attained, he inserts the suction pipe into the bore hole; the pipe is perforated at its lower end with numerous small holes. In the pump which he employs, the barrel, which has the suction valve at its lower end, is enclosed in an outer chamber of cylindrical or other form, which is closed both at the top and bottom. The suction pipe is connected with this chamber at a point intermediate of its height, so that the lower part of the chamber always contains water, in which the suction valve is immersed.—Patent completed.

2814 E. Turner, Bristol. Packing for visions. &c. Dated

2814 E. TURNER, Bristol. Packing for pistons, &c. Dated

2814 E. TURNER. Bristol. Packing for pistons, &c. Dated September 12, 1868.

The inner bark of the linden or lime tree, with the gummy matters removed from it by bolling in an alkaline solution, is employed. The raw inner bark is bolied by preference in a solution of caustic soda for about four hours, and then washed in water until perfectly clean. It is then dried and carded and made ready for spinning. It may then be used in the same manner as flax is at present employed for packing, by being made into the form of rope or band, and saturated with oil or other lubricating compounds.—Patent completed.

compounds.—Patent completed.

2815 W. R. Lake, Southampton-buildings, W.C. Manufacturing brushs. (A communication.) Dated September 12, 1868.

This relates to the manufacture of brushes in which each tuft or bundle of fibre is secured by a separate wire staple in a perforation formed partly through the brush stock. It consists, first, in combining with the bett or carrying apron for feeding in the bristles or other fibres a divider, which separates the bristles, so as to form them into bunches or tufts. Second, in the construction and operation of fingers, made to spread out laterally to effect the separation of the bristles into tufts, and afterwards to carry or push forward the same. Third, in combining the divider and fingers, so that the fingers are made to lift and release the divider. Fourth, in combining with the fingers a slide, which operates conjointly with, and independently of, the fingers. Fifth, in a combination of devices for operating the fingers. Sixth, in combining with the said fingers and skide punch jaws, a wire cutter, and a staple former. And, lastly, effecting, in an automatic manner, varied adjustments of the brush back, or stock to insure a regular insertion of the bristles.—Patent completed. Patent completed.

2816 J. E. COOMBE and S. G. Greeg, Lombard-street, E.C. Coating iron and steel. Dated September 12, 1868. The patentees apply a priming of varnish, made of lac gum. junjer, or any of the gum resins dissolved in naphtha, pyro-acetic, ether, or spirits, or any menstrum capable of taking them up. This priming is applied directly to the surface of the metal, the latter being first heated by any suitable appliance.—Patent abandoned.

2817 J. COPPARD, Park-street. Mincing meat. Dated September 14, 1863.

This relates to a machine which has a cylinder of iron or other substance, wherein are enclosed one or more rows of fixed knives and a series of rotating propellers. It consists, first, in means for supporting the propeller axle, whereby the machine is constructed with a central delivery, and enabled to support the axle in two or more bearings. Second, in constructing the cylinder so that it may have its delivery nozzle readily attached and detached, and be opened and closed without removing the nozzle. Third, in supporting and securing the knives so that they may be readily removed from the cylinder.—Patent completed.

2818 W. B. LAKE, Southampton-buildings. Substitute

for hair stuffing. (A communication.) Dated September 14

for hair stuffing. (A communication, peace and 1868.

This consists in treating the fibre of the soap plant so as to render it suitable for use as mattress stuffing, &c. The plant is first separated into fibres by means of a picker or other suitable device, after which it is boiled for two hours, more or less, in an alkaline solution consisting of 40 gallons of potash, dissolved in 20 gallons of water, for every 20lb. of fibre. The fibre is then washed in clear cold water, and after being dried is spun or twisted into a rope or cord. It is then steamed for about one hour and again dried and picked by hand, or otherwise, when it is ready for use.—Patent abandoned.

2819 C. E. BROOMAN, 166, Fleet-street, E.C. Metallic lates or blocks. (A communication.) Dated September 14,

This consists in manufacturing metallic plates or blocks by superposing in a metal box a certain number of pieces of sheet iron or steel, tinned, galvanized, or coated with lead, zinc, or other suitable fusible metal or composition. -Patent abandoned.

2820 F. SUBOHM-ULTZEN, Westminster Palace Hotel. Generating carbonic acid. (A communication.) Dated September 14, 1868.

tember 14, 1868.

This consists in a cylindrical vessel made of lead intended for the development of carbonic acid from marble or pure lime, and of another cylindrical vessel, also kept closed, serving for purifying the carbonic acid, and of an open vessel of earthenware, glass, or other material, to receive muriatic acid, which should be mixed with water, in the proportion of about three parts of muriatic acid to four parts of water.—Patent abandoned.

2821 C. E. POMMER, Paris. Improved size for paper. Dated September 14, 1868.

This consists in a solution of sulphate of alumina mixed with a solution of resinous soap from which a precipitate of the resinate of alumina is obtained. This precipitate when washed, drained, and pressed, forms the size or compound, which is called "aluminocolli."—Patent completed

2823 J. D. PINFOLD, Rugby. Grinding grain. Dated

2823 J. D. PINFOLD, Rugby. Grinding grain. Dated September 14, 1863.
This consists in a number of fixed chilled plates, suitably grooved or roughened with a runner, composed of natural or artificial stone (the stone which answers the best is the Derbyshire grey). The runner stone may be either flat or conical, and works in combination with the tixed chilled and grooved plates. This machine is driven by any convenient prime mover, but it is proposed to transmit the motion through a frictional driving wheel, mounted either upon the spindle of the stone itself or upon the main shaft of the prime mover.—Patent completed.

2824 J. HETHERINGTON, Manchester. Winding yarn

Dated September 14, 1868

Dated September 14, 1868.

This consists in combining with ordinary winding mechanism arrangements for distributing the yarn or thread so that it may be wound into the cop form. The threads are distributed by an oscillating "faller wire," or by a copping rail sliding up and down. In double-sided machines, the two faller wires or copping rails are connected so as to move simultaneously, and motion is imparted thereto by levers, rods, or other suitable mechanism, acted upon by a reciprocating or rotary "shaper," made to reciprocate or rotate by suitable gearing from the drum driving the spindles.—Patent abandoned.

2825 H. J. TURNBULL Sunderland

reciprocate or rotate by suitable gearing from the drum driving the spindles.—Patent abandoned.

2825 H. J. TURNBULL. Sunderland. Preserving submerged iron structures. Dated September 14, 1868.

In order to prevent the oxidation of the iron, it is covered with a composition consisting of gutta-percha and resin disselved in combination with pine varnish. The surface of the metal is first cleaned and prepared, and the composition is mixed and applied in the following manner:—The surface of the iron is first to be made clean by the application of muriatic or other acid brought to a proper consistency by the addition of ivory black and pine varnish. This mixture is then applied with a brush, and after being left upon the iron for a few hours it must be scraped or washed off with water, in which a little soda is dissolved. When the surface of the metal thus prepared has become dry, the anti-oxidizing composition is applied. The anti-fouling composition for preventing the adhesion of barnacles and marine vegetation to the surface of iron or other submerged material is made by dissolving 40z. of phosphorus in 160z. of bi-sulphuret of carbon and 20z. of absolute vegetable naphtha spirit. Then 21b. of shellac and 20z. of gum benzone are dissolved in absolute vegetable naphtha spirit, bi-sulphuret of carbon, or other solvent, to the consistency of thick paint, and the solution of phosphorus is added thereto.—Patent completed. completed.

completed.

2826 J. FENWICK. Bedford. Annealing overs and kilns. Dated Soptember 14, 1868.

The oven is provided with two fireplaces (charged alternately with fuel), and the flues therefrom pass over the roof and fulminate in the same chimney. These flues are flue and open the other, thus causing the flame and gases of one fire to pass over the other fire before its exit from the oven. To allow the utilization of the waste heat, flues leading downwards are provided, by which the heated gases, as they leave the heating chamber near the roof, may be conducted to a drying room or elsewhere before being allowed to escape.—Patent abandoned.

2827 J. Hewes Unper Manne street. Chelses. Admeriti-

being allowed to escape.—Patent abandoned.

2827 J. Hewrs, Upper Manor street, Chelsea. Advertising by night or day. Dated September 14, 1868.

Two sets of cylinders or frames, rectangular or polygonal in form, are telescopically arranged with a lantern top, the whole revolving on fixed spindles or masts placed at suitable distances apart; and colling on and off diagonally on their circumferences is a long, broad band having advertisements conspicuously written or printed upon each of its sides, and which is in constant self-acting motion.—Patent abandoned.

2828 A. M. CLAPF, Chancery long. Pressing off and

2828 A. M. CLARK, Chancery-lane. Drawing off and offling liquids. (A communication). Dated September 14,

1868.

This consists in a cock of suitable metal or wood and a bung, through which a tin or india-rubber tube passes. The cock consists of a tube with a tapered end for fitting in the cask, and a cylindrical part provided with several smaller nozzle pipes. At the ends of these nozzle pipes are fitted india-rubber tubes whose internal diameter is from 1-4in. to 1-5in., and whose external diameter is about in, the tubes being rather longer than an ordinary bottle.

The apparatus is further provided with a rack consisting of The apparatus is further provided with a rack consisting of spaces corresponding in number to the nozzles, such spaces serving to compress and close the ends of the india-rubber tubes when it desired to cut off the supply. A bung is driven into the hole in the cask, through which is passed a tin or india-rubber tube having a spiral bore of a diameter of about 1-5in. This pipe projects downwards a little above the cock and determines the level for the tops of the bottles, which are readily brought to the desired height by the screw table; when the liquid reaches this level in the bottles the flow ceases.—Patent completed.

2829 E. VICKERS, Goswell-road. Hats and caps. Dated September 15, 1868.

The material employed is paper, pasteboard, or cloth. It is first covered with a coating of size and water, and then exposed to the influence of artificial heat until it is thoroughly dried; then soaked in or damped with water for several hours, when, after being saturated with soft soap and water, it is blocked into the desired shape.—Patent abandoned.

2830 C. D. ABEL, Southampton-buildings, W.C. Securing buttons. (A communication). Dated September 15, 1868. The shank of the button is formed in the shape of a small open-ended tube having a shoulder a short distance from the end. This shank is placed between two jaws secured together by a spring. One of the jaws is fixed to a table or other object, while the other carries a catch whereby, when the button shank is inserted, the loose jaw is drawn up close to the fixed jaw, so as to hold the shank firmly. A metallic point or piercer is then inserted into the open end of the tube, and that part of the article of dress to which the button is to be secured is forced over such point on the shank of the button, so as to lie close against the before-mentioned shoulder thereon. The point is then removed, and a riveting punch is introduced into the open end of the tube, and is caused by pressure or blows to widen out the tube in such a manner as securely to hold the article of dress between it and the shoulder on the tube.—Patent completed.

2831 M. BENSON, Manchester-square, W. Steam pumping

2831 M. Benson, Manchester-square, W. Steam pumping mechinery. (A communication). Dated September 15,

This consists in constructing a steam engine with a cylinder and piston so suited to each other that the piston will perform the functions of a valve in opening and closing the parts of the inlet and exhaust passages. This is accomplished by making the piston as much longer than the stroke as is required to cover the steam ports at each end and exhaust apertures in the centre of the cylinder lengthways alternately at the same time when in operation.—Patent completed.

2832 E. Sarjant, Birmingham. Manufacture of gas fittings. Dated September 15, 1868.
This consists in connecting or joining together the parts of gas fittings by the process of casting in metal or chill moulds.—Patent completed.

2833 H. JEWETT, Kentish Town. Toy representing game ocks fighting. (A communication). Dated September 15,

This consists in placing on or between blocks of wood a bent wire or wires in the shape of bell crank levers, the ends of each of the under levers being connected to a wire terminating in a ring on either end of the box or tray in which the mechanism is contained; and the ends of the upper levers projecting through the lid or covering of the box or tray, and being inserted in a small tube turning or revolving freely on a pivot passing through the bodies or other convenient part of the fighting cocks.—Patent abandoned.

doned.

2834 C. DE BERGUE, Strand, W.C. Gas cooking stores. Dated September 15, 1868.

This consists in constructing gas cooking stoves with a combustion chamber separate or distinct from the cooking chamber, so as that the grease or droppings from the latter may not fall into it, and so arranged with regard to the admission or entry of fame and air that the fame enters in a number of separate jets, surrounded by a current of highly heated air (free from smoke, smell, and taste of gas), through and from the combustion chamber into the cooking chamber. The latter has a grid within it, and its top or roof is made of a hollow curved form, to reverberate or deflect the heat on to the upper surface of the grid, which lies in one of two positions, either in a horizontal position, about level with the bottom edge of the mouth of the combustion chamber, or in an inclined position, with its upper end near to the top at the said opening—Patent completed.

2835 F. Brady, North Gate, Regent's-park. Sweeping

and opening—Patent completed.

2835 F. Brady, North Gate, Regent's-park. Succeping and excarating machine. Dated September 15, 1868.

The sweeping and elevating machinery is carried on a frame or case, supported on road wheels, and adapted to be fixed to the back of a cart, or other travelling receptacle, for the material collected. An endless chain of sweeping brushes, and an endless elevating apron, to receive the material swept up by the brushes, and deliver it into a cart or receptacle arealso employed. The axes of the back rollers which support the endless chain of brushes are so carried that the brushes may fall into and sweep out all the hollows and inequalities passed over by the machine. The machine is so arranged that by rocking the frame on the main axis through a small are of a circle in one direction, the sweeping and elevating apparatus may be thrown out of gear with the driving wheels, whilst by rocking the frame in the opposite direction, the apparatus may be put into gear therewith.—Patent completed.

2836 J. H. SCHUCHT, Store-street, W.C. Pianofories are

gear therewith.—Patent completed.

2836 J. H. Schucht, Store-street, W.C. Pianoforts and other instruments. Dated September 15, 1868.

Sound boards are constructed artificially of alternate plates of hard and soft material, such as beech and poplar woods. The plates of soft wood, such as poplar, should be a quarter-of-an-inch in thickness, and the plates of hard wood, such as beech, should be thinner, and vary according to their position in the finished sound board, relatively to the scale of the instrument. The plates are glued together, side by side, the plates of soft and hard wood being placed alternately.—Patent completed.

2837 W Campion and G. Hall. Nottingham. Washing

wood being placed alternately.—Patent completed.

2v37 W. Campion and G. Hall, Nottingham. Washing
or bleaching. Dated September 15, 1868.

A pan or other vessel is employed, in which is fixed
a false bottom, perforated with a number of holes. In the
centre of the pan is fixed a pipe of conical form, the larger
end being fixed at the bottom. In the lower part of the
pipe suitable openings are made, and at the upper part
branch pipes or tubes are fixed, having suitable openings
or perforations.—Patent abandoned.



2838 J. EDMONDSON, Manchester. Securing metallic hoops for packing bales. Dated September 15, 1868.

This consists in punching or cutting pieces partly out of each end of the boop, so that apertures are made in the hoop; the pieces which come out of the apertures remain attached to the hoop, and are bent slightly outwards. These are formed in reverse directions at each end of the hoop, so that one series of bent pieces or claws at one end enters the openings at the other, and rice resa, constituting a double holder or fastening, and securing the two ends together.—Patent completed.

2839 G. DAVIES, Lincoln's Inn. Hulling and cleaning coffee, rice, &c. (A communication.)

Dated September 15,

This consists in the combination of a series of adjustable This consists in the combination of a series of adjustable spring strippers, provided with sarrated or roughened serrated faces of metal, and an endless belt or band composed of serrated or roughened metallic plates, and also in the arrangement of a stiff brush and an endless serrated or roughened belt, whereby the processes of hulling and cleansing or polishing the coffee, rice, or other grain may be successfully effected in one and the same machine.—Patent abandoned.

2840 B. MARTIN, Westminster Bridge-road. Cleaning

2840 E. MARTIN, Westminster Bridge-road. Cleaning boots. Dated September 15, 1868.
This is composed chiefly of a shallow box or frame, in which are set on edge any convenient number of strips of vulcanized india-rubber, secured between narrower strips of metal or wood, firmly fixed in the wooden or other box or frame. At each side of the box or frame is a raised brush, with the bristles inwards, serving to brush the sides and edges of the boots or shoes. In some instances where a larger apparatus is required, a double brush is placed in the centre, so that both sides of the boot or shoe may be cleaned at a time.—Patent completed.

2841 A. ROOKES, East-street, W.C. Curtais rings.
Dated September 15, 1868.
This consists in fitting or providing the rings with one or more pulleys, rollers, balls, or circular discs, at a point about diametrically opposite the point of attachment of the curtain hook. As the ring is caused to move along the pole, the pulleys, rollers, balls, or discs rotate on their axes or centres, and thereby diminish the friction and noise.—Patent completed.

noise.—Patent completed.

2842 W. R. LAKE, Southampton-buildings, W.C.
Covering for valls exitings, &c. (A communication.) Dated
September 15, 1868.

This sheets or lamins of wood, which may be cut from
a log by turning, or by any other suitable process, are
taken, and one side of such lumins, paper, pulp, or sheets
of paper, cloth, or other textile fabric, are applied, and the
two materials are closely united by pressure, or by the
intervention of any adhesive substance.—Patent abandoned.

doned.

2843 E. HENSSER, Jewin-crescent. Fastenings for travelling bays. &c. Dated September 15, 1868.

A plate of oval or other shape is mounted on the upper or outer side of the jaw, mouth, frame, flap, or other convenient part of the bag or article to be fastened. This plate is capable of sliding to and fro upon an under or inner plate attached to the article or upon a part of its surface, and carries on the under or inner slide a pin or stud, projecting downwards or inwards through the fixed plate or surface, on which the outer plate slides, and engaging with or being innerted into or being connected with a bolt formed or furnished with hooks, which, when engaged with, effects the fastening.—Patent abandoned.

2844 W. DURHAM. Currie. North Britain. Preserving

engaged with, effects the fastening.—Patent abandoned, 2844 W. DURHAM, Currie, North Britain. Preserving stire webs and strainer plates from corrosion. Dated September 15, 1868.

A plate of zinc or other metal, electro positive to the wire, is immersed in the pulp, as near the wire as convenient, and is connected by strips of copper or other metal to the framework of the machine, so that complete metallic contact is established between the wire and the plate of zinc. The plates of zinc must be supported free from contact with any metallic part of the machine, except through the copper strips.—Patent completed.

2845 R. Horson, West Ham, Punching mechine, Detail

2845 R. Hoddon, West Ham. Punching machine. Dated September 15, 1868.
This consists of a fixed bed for carrying the counter dies, made fast to strong end standards, which support the operating parts of the machine. Turning in bearings, in the upper end of the standards, is a longitudinal driving shaft, which receives motion from any prime mover. This shaft is mounted eccentrically, and is embraced by saddles attached to the upper face of a compound slide, extending from end to end of the machine.—Patent abandoned.

2846 C. Havangard M. V. Harrow, Now York, No.

abandoned.

2846 C. Havard and M. X. Harmony, New York. Preserting meat, &c. Dated September 16, 1868.

This consists in preserving animal or vegetable matters, by coating them with a gelatinous solution, prepared from vegetable matters. This solution or jelly is mixed with warm water, until sufficiently liquid, and bisulphite of lime, or any equivalent substance producing the same effect, is added to it, in order to prevent the solution from becoming sour or decomposing. It is then forced into the meat or other substance.—Patent abandoned.

becoming sour or decomposing. It is then forced into the meat or other substance.—Patent abandoned.

2847 J. Orbin and T. Geer. Little Britain, E.C. Catting book edges. Dated September 16, 1858.

The apparatus is intended for cutting the edges of books in which the edge of the binding or cover is flush with the edge of the binding or cover is flush with the edge of the leaves. The framing of the machine supports in vertical slides the cutter frame, in which the knife is adjustable, by means of two screws actuated by a hand wheel. The knife is made of a rectangular shape, forming three sides of a parallelogram, sharpened at its lower edge, and of a sufficient depth to cut through the required thickness. It is fixed below the cutter frame, in the interior of which is a movable "platen," which is pressed downwards by a lever and weight. The table on which the book to be cut is laid is faced with two adjustable guides, to ensure the proper position of the book beneath the knife. The cutter frame is caused to rise and fall by means of two eccentries, forged on a shaft below the table, and actuated by a spur pinion on the driving shaft; gearing into an internal spur wheel, mounted on one end of the cam shaft. The driving shaft is provided with a fast and a loose pulley for steam power, and with a flywheel and handle for hand power, and the fork for moving the driving strap from one to the other is attached to a sliding bar connected to a weighted lever.—Patent completed,

2848 J. HORROCKS, Ainsworth. Looms for wearing. Dated September 16, 1868.

This consists in easting on or applying to the outer arms of the cranks on the crank shaft a ring disc or plate having a circular flange projecting from its periphery.—Patent abandoned.

Patent abandoned.

2849 F. F. GREENWOOD, Hornsey. Fastenings. Dated September 16, 1968.

The patentee combines the frame of the buckle with the frame or box of a lock, so that the whole forms one piece. Beyond and raised above that part of the buckle which receives the free end of the tongue when closed down, he forms a bow-shaped bar or loop, or he makes a hole in that part of the buckle to receive the tongue at pleasure. He forms the base of the tongue upon the bolt of the lock. When the bolt tongue is discharged from the lock, he thrusts the free end under the bow-shaped bar. The protusion and withdrawal of the bolt tongue may be accomplished either by the use of a separate key or by means of the mechanism of the lock buckle itself.—Patent completed.

pleted.

2850 G. R. Samson, Wells street, W. Pianofortes. Dated September 16, 1868.

This consists in a new mode of constructing that portion of pianofortes to which the strings or wires are attached. The strings are attached to a tuning pin which passes quite through the wrest plank, every pin having two holes, one in front of wrest plank, and the other at the back. The wire is then attached to one or other end of the pin, and is brought down and passed under a bridge at the bottom of the sound board. It is then brought up and attached to the other end of tuning pin.—Patent abandoned.

2851 J. WALMSLEY, Preston. Communicating in railway trains. Dated September 16, 1888.

Speaking tubes or tubes for the conveyance of vocal sounds are formed in sections, the section fitted to one sounds are formed in sections, the section fitted to one carriage being formed preferably of a metal tube, and being connected to the section of the adjoining carriage by means of flexible tubes. The ends of the metal tubes are fitted with pertions of unions or couplings, and the ends of the flexible tubes are fitted with the other portions of the couplings, so that the various sections may be coupled together throughout the whole or any portion of a train.—Patent abandoned.

of a train.—Patent abandoned.

2852 H. MARRIAN, King's Heath. Weighing machines.
Dated September 16, 1868.
This relates to platform weighing machines. The weight bar is made in two parts, the upper part or bar being hooked or attached to the machine, and the lower part or bar carrying the weights, the bars being connected together by a spring. When the weights are placed upon the lower bar, the spring is made to change its figure, and to cause an index finger to traverse a divided scale, and to indicate thereon the amount of the weights used.—Patent abandoned. abandoned.

abandoned.

2853 J. DE MASY, Brussels. Holding and withdrawing tickets. Dated September 16, 1868.

The case consists of a box having a series of vertical divisions dividing it into compartments in which piles of the tickets are placed. The front of each compartment is open so as to exhibit the edges of the tickets, the openings being of insufficient width to permit of the tickets passing out by a horizontal motion, except at the bottom, where the openings are wide enough to permit two tickets to pass out. In the bottom of each compartment is a slot, and underneath each compartment is a slide, sliding closely against the bottom. On this slide is a projection which passes through the slot in the bottom of the case, the said projection having shoulders which stand above the bottom of the case. The front end of the slide has a thumb plate, by which it may be drawn outwards. The return motion of the slide is effected by a coiled spring, supported on a rod, on which rod the tail or rear end of the slide works.

—Patent completed. -Patent completed.

-Patent completed.

2854 A. M. CLARK, Chancery-lane. Electro-magnets. (A communication). Dated September 16, 1868.

A soft iron plate is united by ties to a copper plate, parallel with electro-magnets formed of coils, on a soft iron cylindrical core, resting on a plate, and supported in position by pins, their other ends being mounted on the copper plate. The apparatus is arranged so that four of the electro-magnets have their south poles in the iron plate, and their north poles in the copper plate, the other three magnets being placed in the reverse position.—Patent abandoned.

Patent abandoned.

2855 G. B. SHARPR, Llanelwedd, Builth. Fire grates.
Dated September 16, 1868.

The grate or the holder is made of bars of fron, bent into a semicircular or other form, and the ends of these bars are riveted on to two upright pieces of iron. The bottom of the grate consists of bars riveted on to the lowest semicircular side bar. The ends of the top and bottom semicircular bar project beyond the upright pieces, and are bent down, so as to form hooks, which fit into iron eyes, secured by and fixed in or upon the fixed back of the grate.—Patent completed.

2856 J.B. SPENCE and R. R. Kelly, Manchester. Pig-ments. Dated September 16, 1868.

This consists in utilizing the refuse iron arising from the purification of gas as a pigment, the sulphur being driven off by heat. A similar pigment may be obtained from the pyrites used in the manufacture of sulphuric acid.—Patent abandoned.

acid.—Patent abandoned.

2857 W. Betts, Wharf-road. Capsuling bottles. Dated September 16, 1868.

Four or any other number of revolving segments of a circle are employed, which are called "shapers," such shapers being formed to suit the particular make of bottle to be capsuled, and being of a length sufficient to cover the whole of that portion of the capsule which extends behind or below the external shoulder or lip of the bottle neck, or they may be made shorter and the bottle neck moved to and fro longitudinally, so as to cause the shapers to pass over the whole of the smooth surface of the capsule. These shapers, which are preferably made of steel or gun metal, are jointed on to the ends of hinged lever arms, or are carried by converging slides, and are caused to revolve round and converge upon and grip with any desired pressure the capsule upon the bottle neck, by the action either of springs or of the hand of the operator. The neck of the bottle, with the capsule adjusted loosely upon it is introduced between the revolving shapers, and is brought up to a central adjustable stop or gauge. The shapers are caused to revolve rapidly,

and are simultaneously allowed to close upon the capule, either by the action of springs or by the pressure upon a lever, which causes a sliding cone or its equivalent to bring the shaper levers together.—Patent completed.

2858 R. DEA. Birmingham. Combination pulvering plough. Dated September 16, 1868.

The plough-bare and its attendant parts are constructed of a treugh shape, level in the front for entering the soil, and rising behind, for the purpose of elevating the soil by the common draught action of the plough; and at the elevated rear end of the trough, in connection with the ploughshare, either above or below it, the means for separating, dividing up, and scattering the soil so elevated is applied.—Patent abandoned.

2859 W. R. Lake, Southampton-buildings, Hads for dolls. (A communication). Dated September 16, 1863. The head is moulded in two separate parts by two pairs of dies, and the parts are afterwards lapped together, the lapped surfaces being slightly moistened and united by pressure.—Patent completed.

pressure.—Patent completed.

2860 S. Beards, Stowe Park, Buckingham, Stem ploughs. Dated September 17, 1868.
This relates to a patent, dated October 6, 1862, No. 2689. The improved plough is constructed with self-acting, lifting, or tipping mechanism, and running and stop chains, and the latter are attached to the hauling rope, so that the share beams are instantaneously raised and lowered by the first "pull" of the hauling rope at each change of direction. The plough frame is fitted with a stop chain at each end, and the hauling rope connected with both of these stop chains, the free ends of the latter being provided with double hooks, for connecting them with the free ends of the running chains, and also to the share frames, to which their opposite ends are secured. In the centre of the plough frame a transverse shaft is fired, upon which a pair of grooved wheels are mounted, round and over which the two running chains are passed through one of the links of each of these chains, and also through its wheel. A crosspin is mounted to prevent the slip of the chains in the grooves. The length of the two portions of the running chains, between the crosspin and the share frames, is such, that when one set of ploughs is raised, the other is lowered.—Patent completed.

2861 J. Davey, Crofthole. Ploughs. Dated Septembers

frames, is such, that when one set of ploughs is raised, the other is lowered.—Patent completed.

2861 J. DAVEY, Crofthole. Ploughs. Dated September 17, 1868.

The shank or neck of the coulter passes down through the beam, and is supported by a pin through the coulter boss, and is imperfectly adjusted for turning or feathering from right to left, by means of two set screws. The coulter lever or tiller is hung on a stud or upright, in frost of the coulter. A slot is provided, to allow the coulter to become more or less vertical, so that the blade point corresponds with the point of the share. The shank of the coulter bearing against the set screw raises or depresses the coulter blade. The back end of the coulter lever is brought into collision with the breasts, and by the semirevolution of the latter is carried from right to left or for rests, the required position of the coulter blade to the point of the share is given. The handle of the lever is simplicated, by being placed under a hook, which is studed to or formed on each of the stills.—Patent completed.

2862 W. T. WATTS, Birmingham. Annealing raised hollow ressels. Dated Septemer 17, 1868.

Hoops or annular dies are employed, forming a case or jacket, into which the article is closely fitted. This same result is obtained by means of staves or wedge-formed pieces surrounding the article, hooped or otherwise secured, or closely-fitting dies, with a packing of said or other suitable dry material, or even moist plaster of Paris, or other plastic material, which has been allowed to set and become perfectly dry, can be employed. These packing materials are prevented from lifting, from the expansion of the article, by a suitable cover or lid closing the opening of the disc.—Patent completed.

2863 W. E. Newrow, Chancery-lane. Raising seler.

son of the article, by a suitable cover of inclosing use opening of the disc.—Patent completed.

2863 W. E. Newton, Chancery-lane. Raising state. Dated September 17, 1868.

This consists, first, in a combination of two or more cylinders, fitted with reciprocating pistons, mounted on the same rod. The cylinders are furnished with valves, operated automatically by the movement of the pistons, and thereby control the steam passages leading to the opposite ends of the cylinders, so that while either one cylinder of the pair is receiving steam on the one side or face of its piston, and discharging fluid on the opposite side or face thereof, the other cylinder has a balance of pressure established for it on both sides of its piston, and the exhaust steam in or from the latter cylinder is made by its condensation to raise water or fluid. The cylinders are thus used alternately, and are provided with ultable water ways, in connection with passages or chambers, controlled by inlet and outlet valves. Second, in a combination of condensers, placed in communication with the working cylinders at their one ends, and interpesd between the cylinders and the fluid supply pipe or pipes, and outlets or discharge pipes, in connection with suitable fluid receiving and delivery valves.—Patent completed.

2864 A. F. CAMPBELL, Great Plumstead. Ships. Dated

2864 A. F. CAMPIELL, Great Plumstead. Ships. Dated September 17, 1868. This consists in the severance of vessels for cargo pur-This consists in the severance of vessels for cargo purposes in two distinct vessels, one constructed and litted with steam or other motive power engines with rudders, and built so that the available space obsides that necessary for the crew, passengers, and light packages is devoted mainly to the stowage of the fuel, and the other vessel constructed so that nearly its whole space can be devoted to purposes of cargo or passengers. This second vessel is adapted by internal arrangements for the particular trade in which it is to be employed, and being unsinkable when hermetically closed on deck.—Patent completed.

2865 W. R. LAKE, Southampton-huildings, W.C. Explosive compounds. (A communication.) Dated September 17, 1865.

Powder No. 1 is composed of 9lb, of chlorate of potash.

Powder No. 1 is composed of 9lb, of chlorate of polash. Alb. of sulphur, and 4lb. of hight charcoal. Powder No. 2 is prepared with 2lb. of chlorate of polash. Ilb. of ine, dry white sugar, and Ilb. of ferro-prussiate of polash. Powder No. 3 is composed of 4lb. of chlorate of polash. Powder No. 3 is composed of 4lb. of chlorate of polash. 4lb. of charcoal, 1lb. of sulphur or sugar, 2nd Ilb. of ferro-prussiate of polash. 4lb. of sugar, 4lb. of chlorate of polash. 4lb. of sugar, 4lb. of charcoal, mere or less, and 4lb. of sulphur. Powder No. 6 is prepared by using one part of chlorate of polash, 4lb. of sulphur, 4lb. of chlorate of polash, 4lb. of sulphur, 4lb. of chlorate of polash, 4lb. of sulphur, 4lb. of chlorate of polash, and one part of chlorate of polash with the liquid. No. 8 consists of chlorate of polash with the liquid. No. 8 consists of chlorate of polash



pulverized and saturated with the liquid.-Patent com

pleted.

2866 H. WILSON, Stockton-on-Tees. Hydraulic fluid or teem power. Dated September 17, 1868.

This consists of a cylinder of east iron, or other suitable material on the side of which, and along the entire length thereof, a pipe or channel is fixed. On the one end of the cylinder a cock or slide valve is fixed, for admitting the water or other fluid to the interior of the cylinder a piston formed of an india-rubber ball, which rolls from end to formed of an india-rubber ball, which rolls from end to find its admitted at one end of the cylinder, is; placed. When the water or other fluid is admitted at one end of the cylinder, which is done by the action of the cock or slide valve, the ball rolls to the other and closes the Gutlet, so stopping the further supply of water until the valve or cock is shifted, so as to the other end, an in turn stops the outlet at that end.—Patent completed.

2867 G. H. Barth, Westbourne-grove. Administring

Patent completed.

2867 G. H. BARTH. Westbourne-grove. Administering gas for medicinal purposes. Dated September 17, 1863.
This relates to letters patent, dated March 17, 1854 (No. 641). The gasholder is made of zinc, or other metal, and is of the ordinary construction. It is inverted over water in a suitable vessel, which may be fitted with an interior core, if desired, in the customary way, and is fitted with a rod, sealed, to measure the quantity of gas used. It is also provided with counterpoise weights to regulate its weight.—Patent completed.

2862 T INES J JONES J BRANDWOOD, and F. WREN.

weight.—Patent completed.

2868 T. Jones, J. Jones, J. Brandwood, and F. Wren, Manchester. Furnaces. Dated September 17, 1868.

This relates to all furnaces wherein firebars are used, and wherein smoke is evolved. The improvements consist in the adaptation and use of hollow firebars, terminating at the further extremity or back of the furnace, in a chamber which is perforated, and extends upwards nearly to the top of the flue, between which and the top of such chamber the smoke from the fire passes. The air enters the spectrum provided beneath, and at the front end of the firebar, and passing along the bar, becomes heated, and thence passes into the chamber, and out at the perforations thereof into the flue, where it becomes mixed with the smoke, and assists in the burning or consumption thereof.—Patent completed.

2869 J. H. JOHNSON, Lincoln's Inn. Combustion of liquid

thereof.—Patent completed.

2869 J. H. Johnson, Lincoln's Inn. Combustion of liquid fuel. (A communication). Dated September 17, 1868.

This consists in burning liquid fuel directly, and without any admixture of steam or water, upon a peculiar grate, and substantially disposed, the liquid fuel is impelled or caused to flow over the surface of the grate by pressure. It flows in a number of small streams along the face of the several gratebars, which are grooved or channelled longitudinally for that purpose, and having connected to them at their upper ends small liquid fuel supply pipes.

These several supply pipes are fed from a regulator above, which receives the liquid through pipes, and a stopcock in connection with a tank or reservoir situate at a higher level. The air for supporting combustion enters between the grate-bars, as in the ordinary furnace grates. The furnace chamber may either be composed of fireday or surrounded with water spaces and firebrick deflecting arches or bridges may be disposed thereon, as found requisite.—Patent completed.

pleted.

2870 J. H. JOHNSON, Lincoln's Inn. Mode of advertising:
(A communication.) Dated September 17, 1868.

(A communication.) Dated September 17, 1868.

This relates, first, to a mode of advertising, and second, to a peculiar manufacture of envelopes for containing miscellaneous advertisements, and consists in printing miscellaneous advertisements, and consists in printing simple or illustrated advertisements upon envelopes, simple or illustrated advertisements of on envelopes, paper bags, bands, wrappers, and covers for newspapers, or book post and letter or note paper—Patent completed.

2871 R. SMITH, Islington. Prevention of the fouling of ship' bottoms: Dated September 17, 1868.

The patentee places a pipe or pipes along one or both sides of the ship, beginning at the keel. This pipe or these pipes is or are fitted with a compound, generating or producing a strong gas, capable of destroying all barracies, or other animal or vegetable life, capable of fouling ships' bottoms. The gas is to be allowed to escape through an opening or openings in the above-mentioned pipe or pipes, and mingle with the air and water surrounding the ship.—Patent completed.

pipes, and mingle with the air and water surrounding the ship.—Patent completed.

2872 W. CLISSOLD, Stroud. Feeding wool to carding engines. Dated September 17, 1868.

This relates to a patent, dated April 7, 1866 (No. 1000). The following modifications are introduced into the original machine:—The bars forming the bottom of the original machine:—The bars forming the bottom of the box are placed horizontally, and an alternating endway and parallel vertical motion are given them. They are armed at their forward ends with saw teeth, in order that they may the better take hold of the advancing fibres. Near the mouth of the box a rotary comb is mounted, consisting of an oval drum, carrying two rows of teeth, fixed in lines coincident with its largest radius. Behind this rotary comb a grid is set transversely to the box, and with its spaces in the planes of motion of the comb teeth. These teeth as they rotate will take hold of the fibres at the back of the grid and draw them down past a rotary gill, which is set below the grid and a little above the traversing bars, and assists in carrying the fibres forward. While it provents an undue quantity passing from the rear of the box. The fibres carried forward by the rotary comb are taken up by the saw teeth of the reciprocating bars, and delivered to the reciprocating combs before-mentioned. Immediately in rear of the upper comb plate is mounted a transverse sliding toothed blade, which receives a short endway medion, and serves to disturb the advanced fibre, and enable: the comb plates more effectually to take hold of the same.—Patent completed.

take hold of the same.—Patent completed.

2873 J. Head, Ipswich. Wire fence. (A communication). Dated September 17, 1863.

This consists of a single cylinder or windlass barrel, having a small slot in it, through which the wire is passed, thaving a small slot in it, through which the wire is passed and turn in a rectangular frame, one ent of the cylinder and turn in a rectangular frame, one ent of the cylinder and turn in a rectangular frame, which is the other end carries to the frame, as well as through holes at intervals near its cira disc fixed to it, having holes at intervals near its cira disc fixed to it, having holes at intervals near its cira disc fixed to it, having holes at intervals near its cira disc fixed to it, having holes at intervals near its cira disc fixed to be with the slot in the cylinder. When the handle is turned, the wire winds on the cylinder, and sufficient tension having been thus obtained, a pln is passed through one of the

holes in the disc into a corresponding hole in the frame, so as to lock the cylinder.—Patent completed.

noies in the disc into a corresponding note in the frame, so as to lock the cylinder.—Patent completed.

2874 C. H. Hudden, New York. Washing apparatus. Dated September 18, 1868.

This consists, first, of a wash tub or wash box, the bottom ends and sides of which are preferably joined by hitges, so that the parts may be folded compactly together when not in use, and the joints being formed and made tight by causing the V-shaped edge of one piece to set into or against a packing of rushes, flag, india-rubber, or other suitable material, laid into and slightly projecting from a dovetailed slot at the bottom or inner angle of a corresponding V-shaped groove in the opposite piece. Second, of a rubber, consisting of a rigid frame or box, in the lower ends of which the said rubber is hung or pivoted, a rock shaft or rock bar, having holes in it, through which the said swing posts pass, and the necessary horizontal rods or bars.—Patent completed.

2875 E. T. Hushes, Chancery-lane. Wringing machines.

through which the said swing posts pass, and the necessary horizontal rods or bars.—Patent completed.

2875 E. T. Hughes. Chancery-lane. Wringing machines.

(A communication). Dated September 18, 1868.

This consists, first, of one or more endless bands or belts of india-rubber hung on rollers in such a manner as to permit the articles from which it is desired to remove the water to be passed under pressure either between two such belts or between an outside roller and a belt. Second, in the combination with one or two belts of four rollers so sarranged that the articles to be wrung, in passing between the two belts, or between the single belt and two rollers, are twice wrung or subjected to pressure. Third, in the articles write the subject of the subject of two rollers of cogwheels on one or both ends of each of two rollers, the teeth of which wheels mesh into each other. Fourth, in so arranging the belt or belts and the rollers that the operation of pressing or wringing can be performed by a third or a third and a fourth movable roller of perating or pressing upon the geared rollers. Fifth, in the combination with the endless belt or band of a tightening roller. Sixth, in the combination with the jaws orl prongs between which the tub is received of a wedge thrust between a portion of the wringer frame and the tub. Seventh, in a spring made by inserting radial rolls or strips of wood or steel into a centre piece of metal. Eighth, in making the outer rolls or strips bear when the spring is compressed of a curved form. Ninth, in forming the lower of the bands with flanges or raised portions, between which the belt with a suitable yielding material, such as felt.—Patent completed.

2876 W. Cross, Paddington. Carriage doorsteps. Dated

belt with a suitable yielding material, such as felt.—Patent completed.

2876 W. Cross, Paddington. Carriage doorsteps. Dated September 18, 1863.

The patentee forms an external hinge of brass or other suitable metal, which is made with conical cavities near suitable metal, which is made with conical cavities near its extreme ends. Into these cavities pieces of vulcanized india-rubber, or other elastic material, are fitted, so that when the door is fully opened corresponding pieces of rubber or elastic material meet and act as a buffer or spring to prevent the door striking against the body. The same object is attained by fitting the door with hinges of the ordinary kind and adding the improved spring stop by placing the pieces of india-rubber in the centres of metal shields fitted with conical recesses to receive and hold them in position.—Patent completed.

2877 H. VANSITART, Richmond. Screw propellers. This consists in detailed improvements upon Lowe and Harris's patent, dated October 10, 1862, No. 2735.—Patent completed.

completed.

2878 W. CLARK, Baker-street, W. Spring boots for borses. Dated September 18, 1868.

Morses. Dated September 18, 1868.

The boot consists of a linen, woollen, silk, or leather covering, porous or waterproof, which is laced, buckled, covering, porous or waterproof, which is laced, buckled, covering, porous or waterproof, which a padding is applied.—

2879 F. TEMPLINGER Posna Prussia. Polato planting.

Patent abandoned.

2879 E. Tempelhorf, Posna, Prussia. Potato planting machine. Dated September 18, 1868.

This consists of a new contrivance for planting, by which three rows of potatoes are planted simultaneously, which three rows of potatoes are planted simultaneously. The machine rests chiefly on the hind part of a carriage, and is connected by shears by means of a clutch, with a lore part to direct the course of the machine. Three parallel rows of elevating apparatus are united perpendicularly at their longitudinal axes and convey the single potatoes from the principal receptacle into the actual planting apparatus or planting pipe close to the soil, whence they can drop singly at any desired intervals. The potatoes thus planted are then covered by a plough attached to the hind part of the apparatus.—Patent completed.

attached to the hind part of the apparatus.—Patent completed.

2880 E. T. Hughes, Chancery-lane. Grinding, smoothing, and polishing glass, &c. (A communication). Dated September 18, 1868.

This consists of a truck constructed of wood or other suitable material, mounted on wheels, and carrying a circular or other shaped horizontal table free to revolve on a cular or other shaped horizontal table free to revolve on a shaft passing through the centre of the truck, and resting on a footstep at the base thereof.—Patent abandoned.

2881 W. NEEHAM and J. KITE, Vaukhall. Depurating fluids. Dated September 18, 1868.

The object is the employment of paper as a filtering medium under high pressure. An even surface is obtained by the use of perforated plates or diaphragms of equal or of greater length and breadth or diameter than the frames forming the supply and discharge chambers. A textile fabric—an ordinary filtering cloth, for example—is interposed between the paper and the perforated diaphragm. To enable the ensy introduction of paper into the press, holes are made in the frames, forming supply chambers in the perforated diaphragms, and in the cloths. These holes correspond with short tubes set in holes in the frames forming the discharge chambers, so that when the whole are placed in juxtaposition they form supply and discharge conduits traversing the press or depurating apparatus from end to end.—Patent completed.

2882 J. SMITH and J. DEWNNEY, Leadenhall-street.

apparatus from end to cud.—Patent completed.

2832 J. SMITH and J. DEWDNEY, Leadenhall-street.

Steam boilers. Dated September 18, 1868.

The inner tubes are extended some distance above the upper ends of the outer tubes, and are connected together by means of a solid plate or diaphragm, in which such inner tubes are firmly secured, either flush with the plate or projecting above the same if required. In the plate other apertures may be formed in which other tubes may

be fixed, passing up to, above, or below the water level, for facilitating the conveyance of the steam to the steam spaces of the boller. The plate also serves to prevent priming, and to receive some of the solid matter contained in the water. The plate may be flat or convex, and may be formed in segments, or with ribs or corrugations. In another arrangement, the outer tubes are carried up above the crown plate to the before-mentioned plate or diaphragm in which they are fixed, either flush or so as to project above the same, and the upper ends of the inner tubes are formed with a bend passing through the outer tubes at a point between the crown plate and upper plate.

—Patent completed.

2883 W. H. Hughan. Newton Stewart. Treating accounts.

Patent completed.

2883 W. H. Hughan, Newton Stewart. Treating seesage.
Dated September 18, 1868.
This consists in the application of Portland, Roman, or other suitable cement, to deodorize and solidify night soil, sewage, filth, urinary and bestial products of farm steadsewage, filth, urinary and bestial products of farm steadings, shudge, the waste of manufactories, and refuse in general.—Patent completed.

general.—Patent completed.

2834 G. Bernhardt, Radeliffe. Preparing spinning
and doubling fibrous materials. Dated September 19, 1868.
This consists, first, in applying a shaft or bar to machines for preparing spinning or doubling fibrous
materials where leather covered rollers have to be pressed
upon fluted rollers by weights, levers, or springs, so that
upon fluted rollers by weights, levers, or springs, so that
upon the rollers may be simultaneously removed or applied
at will. Second, in securing the cloth at intervals to the
plate or cover to allow it to traverse with
in slotting this plate or cover to allow it to traverse with
the "drag cloth." Third, in the use of an L trough to
receive the full bobl ins. the front of the copping rail
forming one side of the trough.—Patent completed.

2835 IT. Berney, Bracon Hall. Norfolk. Construction of

2895 T. BERNEY, Bracon Hall. Norfolk. Construction of defensive armour. Dated September 19, 1868.
This relates to a prior invention patented January 26, 1867. No. 193, and consists in a number of Improvements in the details of the construction of the defensive armour, &c., therein described.—Patent abandoned.

286 M. MACDERMOTT, Edwarde-square, W. Street lemp reflector. Dated September 19, 1868.

A disc is placed within the lamp above the flame, and beneath it are four vertical plates crossing each other at right angles with the opposite angles of the lamp frame.

—Patent abandoned.

Patent abandoned.

2887 J. BLAKEY, Leeds. Repairing boots. Dated September 19, 1868.

This consists in making a last of iron or other suitable metal instead of wood. The last is made in two halves, connected at the heel by a hinge joint. Each part is internally recessed, and tapers towards the toe to a lmit the passage of a screw boit, to the outer end of which a the passage of a screw boit and the heel part of the last. through which the screw acts as a fulcrum, and when the screw is urged forward, the toe, by reason of the guide working within the tapered part, is opened out as much as requisite.—Patent completed.

2888 F. Dyer. Camden Town. Hot scales apparatus

much as requisite.—Patent completed.

2888 F. Dyer, Camden Town. Hot water apparatus.
Dated September 19, 1868.

This consists, first, in the use of the tubular fireback made of malleable iron or other metal cast in one piece from tubes crossed or cast or wrought in any other way, or constructed of pipes or tubes of any form or shape and of any metal. Second, in the manner of connecting the tubular fireback with the hot water cylinder. Third, in the application and use of a return pipe with ball valve inserted to prevent the upward flow of water in the return pipe. Fourth, in the method or mode of connection by which all parts of a dwelling house or other building can be supplied with hot water by the use of a hot water cylinder, reservoir, or tank placed near the kitchen lire and in connection with the tubular fireback.—Patent completed.

pleted.

2889 W. HAYNES, Middle Hutton. Drewing leather
Dated September 19, 1868.
This consists in an improved machine for performing
the operations in dressing leather known as washing
the operations in dressing leather known as washing
the operations in dressing leather known as washing
the order of the various properties.
Also in drawing the goods out of the vat or pit in which
they have been worked by an improved method. The
machine can be applied to washing cotton waste, rags, and
other materials.—Patent completed.

other materials.—Patent completed.

2890 J. Brown, Huddersfield. Extracting water and other liquids from raw material and manufactured goods.

Dated September 19, 1868.

The apparatus consists of a concave table, dish, or essel (by preference, fluted), upon which the substances to be operated upon are to be placed, to which a pipe in connection with a pump is applied. A cap or cover of india-rubber or other air or waterproof cloth or flexible material is attached to the edge of the dish over the substances.—Patent abundoned.

2891 L. DESENS, Charling Cross. Miner' lamps. Dated

stances.—Patent abandoned.

2891 L. DESENS, Charing Cross. Miners' lamps. Dated
September 19, 1868.

In the centre of the gallery and platform bearing the
wick-holder is a cylindrical tube (an opening being cut
for its reception), round which a spring is coiled; in the
interior of the cylinder is the wick-holder, which is a
small tube having soldered or otherwise fixed at one side
three small teeth, which goar with an endless screw tarning on an axis. The shaft on which this is mounted
revolves below in a small tube.—Patent abandoned.

2892 G. INNER New Cross. Eding spathings. Dated.

revolves below in a small tube.—Patent abandoned.

2892 G. INNES, New Cross. Rifting machines. Dated
September 19, 1868.

The bed of the machine is constructed like that of an The bed of the machine is constructed like that of an ending the leads. Upon this bed a saddle or carriage removing the heads. Upon this bed a saddle or carriage removing the neads. Upon this bed a saddle or carriage is fitted, and connected by a suitable nut to a screw extending from end to end of the bed. Parallel with this screw, and preferably outside the bed, is a toothed rack, into which is geared a pinion, fixed on a short transverse screw spindle, supported in suitable bearings on the screw spindle, supported in suitable bearings on the travelling carriage or saddle. The latter carries a rack, which is litted to work in a guideway. This rack is converted by a nut, with the transverse screw, and gears into a pinion on the thrust bar, to which the tool bar is fixed, which bar is thereby caused to rotate as the carriage or saddle moves along the bed. The pitch of the rifling is varied by changing the relative speed of the carriage and thrust bar.—Patent abandoned.

2893 B. Dickinson, Hopetown, India. Treating leaves of

2893 B. DICKINSON, Hopetown, India. Treating leaves of tea plant. Dated September 19, 1868.
For the purpose of removing the julces, the fresh gathered leaves, or the gathered leaves, which yet contain



in their cells the natural juices, are pressed in a bag made of hair, or other strong and porous material. For the purpose of rupturing the vessels of the leaves, without otherwise breaking or injuring them, the bag containing the leaves is placed between a pair of rollers, under pressure, obtained by well-known mechanical means, and one or both of the rollers are caused to rotate, so that when the bag has been passed through the rollers once or twice, the whole, or a sufficient amount of the juices, shall be expressed from the leaves. For rolling (cigar like) the leaves, an endless band, upon which the leaves are received and carried forward against and under freely revolving rollers, but which may be capable of being regulated or retarded in their motion: or instead thereof is employed two endless bands, moving in contrary directions, but parallel to each other, horizontally, may be made use of.—Patent completed.

2894 B. Dickinson, Hopetown, India. Withering and

directions, but parallel to each other, horizontally, may be made use of.—Patent cempleted.

2894 B. Dickinson, Hopetown, India. Withering and desiccating leaves. Dated September 19, 1868.

The object is the more uniform, perfect, and economical treatment of the leaves of the tea plant, and the leaves and flowers of other plants, requiring to be prepared by withering and desiccation. A current of heated air, admitted under regulation as to its temperature, volume, and velocity, is employed, directed so as to come in contact with, and pass through, amongst, and over the materials be treated. A series of trays or shallow boxes, without covers, are constructed of the same size, and capable of fitting into and side by side the one with the other, each having a bottom of open cane work, upon which the green leaves or other materials are heaped, to a suitable thickness, to allow of the air pressing freely up through and amongst the leaves. These trays are placed in or upon a frame of woodwork, upon an open top trough of brick or earth, with closed ends, of such dimensions as to take one or two of the trays, two or more in height, and several in the length of the frame, and one set of trays is so set against the other, and one layer of trays so set upon another, that the heated air passing into the trough can only escape through the bottoms of the trays containing the leaves, and so through the leaves, withering and desiccating them in its passage.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT

Dated March 23, 1869.

876 J. Nicol, Stirling. Improvements in envelopes.

877 R. Gregson, Wigan, Lancashire. Improvements in
the construction of firebars to be employed in furnaces.

878 G. Blanche, Rue Gaillon, Paris. Attaching purses
or other articles to the pockets or clothing to prevent loss

or robbery.
879 C. Longfield, Lancaster-street, Birmingham.

provements in cramps for flooring boards and other puroses. 880 J. Macintosh, North Bank, Regent's Park. Improve-

880 J. Macintosh, North Bank, Regent's Park. Improvements in the application of elastic illiets, cords, or bands to boots and shoes and other articles of wearing apparel.
881 L. A. Israel, Crescent, Minories. Improvements in the mode of, and machinery or apparatus for, manufacturing sulphuric acid.
882 C. de Bergue, Strand. Improvements in, and in apparatus for, making holes in metal.
883 J. Fryer, Redcar. An improved rotary cultivator.
884 J. H. Johnson, Lincoln's Inn-fields. Improvements in artificial stone blocks applicable to streets, railways, and building purposes.
885 F. Rudrum, Norwich. Improvements in velocipedes.

pedes. 886 J. Horsley, Cheltenham. Improvements in protecting nitro-glycerine for conveyance and storage.

887 F. de Bowens, Philadelphia, Pennsylvania, U.S.A.
Improvements in machinery for making match splints
and other similar articles.

### Dated March 24, 1869.

Dated March 24, 1869.

888 M. F. Maury, Upper Gloucester-place, Dorset-square, N.W. The heating of railway and all other carriages, steamers, vessels, public and private apartments, or buildings, by means of electricity.

889 J. B. Fell, Spark Bridge, near Newton-in-Cartmel. Improvements in, or applicable to, locomotive engines, carriages, and permanent way, adapted more particularly for railways having steep inclines, but which may be used upon railways of ordinary gradients.

890 B. W. Page, South Molton-street, Oxford-street. Improvements in the construction of garden and fire engines for pumping and forcing water.

891 W. Harrison, King Edward street, City. An improved sunshade applicable to hats and certain other

proved sunshade applicable to hats and certain other head coverings.

ead coverings. 892 C. M.Dermott, Tunnel Hotel, Edge Hill, Liverp

892 C. M-Dermott, Tunnel Hotel, Edge Hill, Liverpool. An improved press for applying combined eyelets and paper fasteners and the ordinary shoe eyelets.
893 F. J. Manceaux, Paris. Improvements in firearms, and in apparatus for charging the same.
894 V. Chemery, Sedan, France. Improvements in the construction of apparatus for damping and pressing simultaneously the surface of cloth and felted fabrics revious to finishing.
895 I Navill Abstractancy Monmouthabits. Improved.

895 J. Nevill, Abergavenny, Monmouthshire. Improved see J. Nevill, Abergavenny, monmoutanire. Improved means of, and apparatus for, securing window sashes and blinds, in rendering the sashes weather tight, and in removing the strain from the lines when the sashes are los ed.

896 W. E. Newton, Chancery-lane. Improvements in

896 W. E. Newton, Chancery-lane. Improvements in he mechanism for working heavy guns or ordnance.
897 A. Clayton, Southampton, and J. Riloy, Birmingham. Improvements in firearms.
898 T. Shakespear and G. Illston, Birmingham. Improvements in sewing machines.
899 C. B. Parkinson, A. and J. Metcalf and W. H. Heald, Preston. Improvements in mules for spinning.
900 F. Baker, Kennington, Surrey. Improvements in means and apparatus for locking and unlocking railway point and signal levers.
901 J. Woodhead, Bradford. Improvements in flooring cramps.

902 W. J. Cunningham, New Oxford-street, and A. M'Carthy, Broad-serect, Middlesex. Improvements in obtaining motive power.
903 E. Peyton, Birmingham. Improvements in the

manufacture of rollers, cylinders, or tubes for printing upon textile fabrics or other materials, or for other purposes,

#### Dated March 25 1869.

Dated March 25, 1869.

904 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in machinery for folding paper.

905 J. J. Bodiner, Newport, Monmouthshire. Improvements in the manufacture of iron and steel, and in the appuratus to be employed therein, part of which improvements are also applicable to the treatment of other metals and alloys.

906 F. Hurd, Rochdale. Improvements in machinery for excavating coal and other minerals, and in apparatus for compressing air for driving the same, and for other purposes.

purposes, 907 J. R. Baillie, Rochefort Villas, Hoe-street, Waltham-

stow. ballast,

907 J. R. Baillie, Rochefort Villas, Hochstreet, Walthamstow. Improvements in waggons for carrying coal, coke, ballast, and other like goods and materials.
908 J. H. Johnson, Lincoln's Inn-fields. Improvements in the manufacture of iron and steel.
909 T. Champion, Northamptonsbire. A new and improved method of constructing the flues or chimneys of houses and other buildings, and in apparatus connected therewith.
910 J. T. Greenfield, Pencester-street, Dover. An improved side arm for clearing the chambers and rifling of ordnance.

ordnance. 911 T. Baker, Duke-street, Brighton. Improvements in

re-escapes.
912 W. C. Dreyer, Gresham-street, City. Improvements

912 W. C. Dreyer, Gresham-street, City. Improvements in machinery for tilling land.
913 J. T. Calow, Staveley, Derbyshire. Improvements in safety apparatus applicable to cages or hoists used in mining or lifting machines.
914 C. Marsden, Kingsland-road, Middlesex. Improved

914 C. Marsden, Kingsland-road, Middlesex. Improved means of, and apparatus for, making gas and watertight flexible joints to pipes and tubes.

915 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in machinery for pressing oil, tobacco, cotton, and other materials.

916 W. Meakin, Great Woodstock-street, Marylebone. An improved apparatus or means for raising, lowering, and securing sliding window sashes.

917 W. R. Lake, Southampton-buildings, Chancerylane. An improved electro-magnetic machine.

918 T. Sowden, Moor-crescent, Hunslet, Leeds, and J. Newton. Leeds. Improvements in bobbins, and in regulating the motion of bobbins in machinery, for preparing, spinning, doubling, warping, and reeling flax, cotton, and other fibres, and in other machinery in which bobbins are

919 H. A. Bonneville, Sackville-street, Piccadilly. A new and improved electric clock.

# Dated March 27, 1869.

Dated March 27, 1869.

920 A. C. Kirk, Glasgow. Improvements in cooling liquids, and in apparatus therefor.

921 J. Macintesh, North Bank, Regent's Park. Improvements in working guns, and in apparatus connected therewith.

922 H. Downie, Corstorphnie, Mid Lothian, and I. B. Harris, Edinburgh. Improvements in shoes for horses.

923 W. E. Gedge, Wellington-street, Strand. A novel construction of box for holding matches and other articles.

924 G. Dymond, Birmingham. A new or improved baking powder.

925 L. Hannart, Upper Charles-street, Clerkenwell. An improved muzzle for dogs and other quadrupeds.

926 G. Hodgson, Bradford, H. Bottomley, Low Moor, near Bradford, and E. Cockroft, Odsall Moor, near Bradford. Improvements in looms for weaving.

927 J. J. Bagshawe, Thames Steel Works, Sheffield.

927 J. J. Bagshawe, Thames Steel Works, Sheffield. Improvements in machinery for manufacturing semolina

and flour.

928 N. Voice, Handcross, Sussex. Improvements in, or
pacted with greenhouses, and other buildings, part of 928 N. Volce, Handcross, Sussex. Improvements in, or connected with, greenhouses, and other buildings, part of which is applicable to stretching wires in other situations for training plants or trees. 929 H. Haschke, Watling-street, City. Improvements in breech-loading firearms.
930 D. Jones, Birmingham. Improvements in the manufacture of buckets, pails, and other similar articles of hollower.

of hollowers.

931 F. Parker, Leeds. Improvements in locomotive engines working on the central rail system.

932 J. Jaquillard, Chancery-lane. Improvements in musical boxes.

933 B. J. B. Mills, Southampton-buildings, Chancery-

933 B. J. B. Mills, Southampton-buildings, Chancerylane. Certain new and useful improvements in processes
and apparatus for extracting oleaginous matter from
vegetable, animal, or mineral substances, in the preparation of material for distillation, and the manufacture of
starch, sugar, and fertilizing agents.
934 J. W. Girdlestone, Norfolk-street, Strand. Improvements in constructing and treating ships and vessels to
correct and prevent compass deviations.
935 E. H. Hirch, Brunswick, Germany. Improvements
in storing and preserving meat and other articles of food
on board ship, and in the construction of ships and apparatus for that purpose.
936 W. Riddell and T. Bletcher, Bishopsgate-street,
City. Improvements in sewing machines.

City. Improvements in sewing machines.

### Dated March 29, 1869.

937 F. B. Taylor, Glasgow. An improved numerical counting and recording machine.
938 G. Bloem, Dusseldorf, Prussia, and E. Scheidt, New York, U.S.A. improvements in breech-loading firearms, and in cartridges to be used therewith and with other descriptions of breech-loading firearms.
939 W. B. Lake, Southampton-buildings, Chancerylane. Improvements in the manufacture of soda and potash.

ue. Tash

potash.

940 W. R. Lake, Southampton-buildings, Chancery-lane. An improved blowing apparatus.

941 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in the manufacture of horse-shoe nails, and in machinery employed in such manufacture.

942 E. Morewood, Rock Cottage, Briton Ferry, Glamorganshire. Improvements in coating metals.

943 S. Firth, Leeds. Improvements in picks and rail ways for cutting coal and other minerals, part of which can be applied to railways used for other purposes.

944 A. Clark, Chancery-lane. Improvements in stereoscopes.

scopes. 945 W. P. Hope, Wouldham, Kent. Improvements in coment and other kilns.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," March 30, 1869.

stte," March 30, 1869.

3613 E. Stevens
3621 A. M. Clark
3625 A. Wyllie and J.
Latham
3638 L. Pfeiffer
3648 W. E. Newton
3718 A. Homfray
3725 T. Kennan
3726 A. M. Clark
3748 F. Meadows
3927 J. W. Wilson
3928 A. V. Newton
3929 A. M. Clark
3941 H. Yorath
3979 W. R. Lake
38 J. Stevens
261 C. Lungley
595 W. R. Lake
670 W. E. Gedge
694 L. M. Huiz
100 R. F. Peliz and T. H.
100
18 W. R. Lake 3473 T. Berney 3481 E. and A. Priest 3487 S. W. Campain 3492 Gerard, Marquis of Montrichard Montrichard
3507 A. W. Drayson
3512 G. V. Fosbery
1513 S. Crichton and J.
Taft
3519 D. Jones and J.
Jackson 3°21 J. Green 2523 J. M.Glashan 2523 J. M. Glashan 3533 G. Eguillon 3544 C. E. Brooman 3544 C. J. Foster 3545 F. W. Webb 3546 W. Inglis 3550 I. Hudson 3551 E. T. Hughes 3552 J. Howlison 3562 T. Smith and J. V. N. Bazaigette 3588 G. Baker Lee
718 W. B. Lake
722 G. H. T. Finzel
736 C., W., and J. Drake
759 W. R. Lake
794 W. R. Lake 3588 G. Baker 3590 W. E. Gedge 3593 N. D. Spartali 3600 F. Holt

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

# LIST OF SEALED PATENTS.

Degreed man	CH 20, 1005.
2976 J. Wadsworth	2989 W. Gadd and J.
2977 W. E. Gedge	Moore
2979 J. H. Irwin	2991 V. Juge
2980 E. T. Hughes	2992 J. Mabson
2981 A. H. Brandon	2995 W. Richardson
2984 W. Hallam and H.	3006 H. Highton
J. Madge	3013 R. Legg
2987 E. Horton	3023 N. Henwood
2988 G. Daws	3026 C. E. Brooman
2990 H. Jewitt	

# PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID

901 W. Deakin and J. I Johnson 905 T. Ryder 915 J. C. Martin
953 E. C. Prentice 984 J. and W. M'Naught
1 00.0.000

# PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

815 E. Morewood and A. Whytock	913 H. Smith 914 J. H. Johnson
825 E. Morewood and A. Whytock	919 H. J. Madge 929 G. and J. Collier
859 W. F. Smith and A. Coventry	952 J. C. Kay and W. Hartley
903 H. Pooley	1027 C. P. Coles

# PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the following numbers:—

8775	433	725	768	782	796	810	824
8863	437	727	770	784	798	812	826
161	451	739	772	786	800	814	828
181	690	760	774	788	802	816	830
261	705	762	776	790	804	818	832
343	717	764	778	792	806	820	834
372	721	766	780	794	808	822	1

### LIST OF SPECIFICATIONS PUBLISHED For the week ending March 27, 1869.

No.	F	r.	No.	F	ъ.	No.	F	r.	No.	Pr.		No.	F	r.	No.	F	T.
	s.	đ.		8.	đ.		9.	d.		9. d	Ī.		8.	đ.		В,	đ,
2431	0	4	254	3/2	0	2561	0	4	2573	0 .	4	2590	0	4	2603	0	4
501	2	٤	254	10	4	2563	0	4	2575	0	8	2591'	0	4	2604	ı	2
505	0	16	2548	10	4	2564	0	8	2576	0 .	4	2592	0	10	2605	0	4
508	0	- (	255	οlo	4	2666	0	4	2578	0 .	4	2594	0	8	2606	0	4
2510	0	٤	255	1	4	2567	0	8	2581	0 .	4	2595	0	4	2607	0	8
512	1	4	255	2 0	4	2568			2583						2608		10
518	0	10	255	30	4	2569	0	10	2585	0 4	4	2.98	0	4	2609	1	4
2525	10	8	255	1	2	2570	0	8	2586	0 1	o	2600	0	10	2626	0	4
2528	0	٤	255	50	4	2571	0	4	2587	0 .	4	2601	1	0	3681	1	0
2539	1	٤	256	1	4	2572	1	2			1						

NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining cepies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our recaders are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shilings may be remitted in postage stamps, for sums above that amount a Post Office MoneyOrder should be sent, payable to ROBERSON, BROOMAN, and CO., Patent Department, 166, Fleet-street, Loudon, E.C., to whom all communications upon the subject should be addressed.

THE

# MAGAZINE. MECHANICS'

LONDON: FRIDAY, APRIL 9, 1869.

# EXPERIMENTS RECENT GUNNERY EXPER AT SHOEBURYNESS.

THE recognition by the United Government of the superiority of rifled oversmooth-bore artillery, as lately announced in our columns, hardly prepared us for further experiments with this class of ordnance in our own country. Nevertheless, on Wednesday week, Shoeburyness re-echoed to the reports of the 15-inch Rodman gun, which has been fired, not, however, so much with a view of experimenting with the gun as testing some new cast shot recently made in England. The gun was laid against the Plymouth case-mate at 200 yards range. The powder charge was 83¼lb. of large grain powder, and the three shots fired weighed 457lb., 451lb., and 450lb. respectively. The new shot are spherical, and are made from a mixture of cast and refined iron at the Woolwich Laboratory, upon the method patented by Dr. D. S. Price, the original material having been first proposed by him to the Iron Plate Committee of 1862, both for projectiles and guns. The three rounds fired were highly interesting, as proving that round shot for large smooth-bore guns can be made in England of superior quality to the American shot. They, moreover, possess this advantage, that whilst the American shot are all turned true by ma-chinery, these shots are cast in moulds with such exactitude as to be ready for use without any such subsequent mechanical operation. The three Price's shots fired on the present occasion were true to the 1-300th of an inch, and passed through the gauging rings both ways with exactitude.

The first round with the 457lb. shot struck the 20-inch thick portion of the Plymouth casemate, making an indent 15 in. across, and 5in. deep, the indent, being saucer-shaped, with very steep rounded sides; 9in. below the indent was a curved crack, 2ft. 4in. in length; and, above it, a crack extended diagonally 9in to an empty bolt-hole, and thence beyond to the upper proper left corner of the lower portion of the plate. From the above bolt-hole, another crack ran off at right angles to the first. A large triangular piece of the covering plate, measuring 3ft. 8in. by of the covering plate, measuring 511. Sin. by 11in. by 16in., was carried away. The head of a 3-inch through bolt was also broken off, whilst behind the plate the 5-inch face plate of the proper 15-inch thick structure of the casemate was indented and buckled. At the rear of the casemate, the vertical buttress on the left proper of the port was bent; another vertical buttress 2ft. to the left was also bent. The second round was with the 451lb. shot, which struck the 15in. portion near the porthole. More than half the shot remained fixed in the plate, plugging the indent, the centre of which was 3ft. 11in. from the granite base, the upper circumference of the shot being only 2in. away from the upper edge of the plate. The metal here was split through, but there was no other fissure in the plate in direct connection with the shot-hole. Cracks extended in various directions, and at the rear The 450lb. considerable damage was done. shot, in the third round, took effect on the upper portion of the proper left wing of the casemate, where it was 20in. thick. It brought down two large pieces of the plate, which had been battered in previous experiments. The centre of the indent was 16in. from the proper centre of the indent was folia. From the proper right edge of the covering plate, adjoining and in line with the upper part of the port, the shot-hole being plugged by more than half seconds. In Mr. Pettman's fuze, the detonation of the detonation of the port, seconds.

At the rear, the shot, which remained in it. the vertical buttress on the left of the porthole was bulged and otherwise slightly damaged.

The striking velocities of the shot were as follows:—Round one, 1,360ft. per second; round two, 1,370ft.; and round three, 1,383ft. The general effects upon the Plymouth casemate structure were very remarkable, in the flaking away of the thick face and covering plates, and in the bursting out of large portions of the rear planks and vertical struts.

The first action of impact upon the front plates was to block out squarish areas by the extension of the old fissures of former rifleshot wounds; then the effect of the vibration of the layers of iron plates and planks against each other was to cast these blocked-out spaces to the front, a peeling action tending to the rapid disintegration of the iron wall. The results were highly satisfactory in establishing the valuable character of the metal of which the shot were composed. Next week which the shot were composed. Next week we shall give an engraving and description of the Rodman gun, in accordance with wishes expressed by some of our readers, since our article on "American Ordnance," which appeared a fortnight since.

The remaining experiments on the same day were made in order to test the endurance Colonel Shaw's muzzle-pivoting gun carriage on a wrought-iron platform. In these, the 10-inch 18-ton rifled gun was employed, and from it thirteen rounds were fired. The weight of the carriage was 155½cwt., and that of the platform 73¾cwt. There were eleven gallons of water in the hydraulic buffer, and the charges consisted of 60lb. of large grain rifle powder and 400-pounder projectiles. The results may be thus summa-rized:—Rounds one to five were point blank, rized:—Rounds one to five were point blank, the recoils being respectively 4ft. 6in., 4ft. 7in., 4ft. 9in., 4ft. 9in., and 4ft. 7in. Rounds six and seven were fired at 1deg. elevation, and the recoils were 4ft. 7in. and 4ft. 5in. Round eight, at 4deg., showed a recoil of 4ft. Round nine, elevation given 9deg., recoil 4ft. 3in. The gun ran down 1deg. after firing this round, through the slip of the clamp. Rounds ten through the slip of the clamp. Rounds ten and eleven, at 9deg., gave recoils 4ft. 2in. and 4ft. 2in. Rounds twelve and thirteen, at 10deg., gave recoils of 4ft.1in. and 4ft. 2in. Throughout the trials, the carriage worked well, nothing whatever going wrong in its

action.

Another series of experiments was carried out this day week with the first of a new class of heavy ordnance-a 4-ton 9-inch howitzerand with sensitive fuzes required for projecand with sensitive fuzes required for projectiles of this kind of artillery when low gun charges are employed for vertical fire. The gun is made of wrought iron on the muzzle-loading principle. It is rifled with five grooves, the rifling having a uniform twist of one turn in thirty-five calibres. The gun weighs 76cwt. 2qr., and has a breech preponderence of 2cwt. 3qr. 2lb.; the length over all is 6ft. 4in., and length of bore, 4ft. 6in. This howitzer was mounted on a wrought-This howitzer was mounted on a wrought-iron bed placed on a 13-inch sea service mortar octagonal wood deck, the weight of the iron bed being about 42cwt. The arrangement for traversing was by two eccentric gun-metal trucks, one at the front and one at the rear of the bed, working upon two flat circular gun-metal racers screwed down on the wood deck, the bed being kept in place by a strong central iron 13-inch mortar pivot. The elevation of the howitzer is obtained by arc-racks and pinions on each side of the iron bed, the piece being clamped in its posi-The maximum elevation tion of elevation. obtainable is about 40deg. The fuzes were of three kinds, viz., a metal percussion fuze, designed by Mr. Pettman, and made more sensitive than the service metal percussion sensitive than the service metal percussion fuze which bears his name; a metal percussion fuze, proposed by Colonel Boxer; and a service Boxer wood time-fuze for muzzle-

ing ball is heavier than in his service fuze, the fulminate is more sensitive, and the surface of the chamber is corrugated to facilitate the detonation. Colonel Boxer's fuze is a cylinder containing the meal powder charge at the rear end, this being covered with a brass cap resting on ledges in the cylinder and containing the fulminate in its centre. Over this again is screwed a sunk thin brass disc, with an anvil projecting inwards over the fulminate to about the tenth or fifteenth of an inch from its surface. When the fuze in position in the head of the rifle shell strikes ground, the earth is driven in upon the thin metal disc, and forces the anvil suddenly down upon the fulminate, thereby producing detonation.

The shells used in the first part of the experiments were of the ordinary character, 18in. long, and having a capacity for a bursting charge of 7lb. of powder. They were ing charge of 7lb of powder. They were weighted up to 200lb., in some cases by sand and sawdust at the bottom of the shell, the top portion only being filled in with powder to give a report or burst. It was necessary to adopt this precaution in order to prevent the possibility of accident, in the event of any of the fuzes acting prematurely when the shells were fired with a howitzer charge much less than the bursting charge of the shell. In other cases, when the fuzes were found not to act prematurely, the shells were filled up with the full charge of 7lb. The powder used was, in all cases, rifle large grain. In the first series of trials, an elevation of 35deg. was given to the howitzer. Rounds one, two, and three, were fired with a Pettman's fuze and three, were fired with a Pettman's fuze and a 3lb. powder charge, which charge was used for twelve rounds. The times of flight were respectively 14·2sec., 14·3sec., and 14·1sec. to graze; the fuzes, however, failed to act. Rounds four, five, and six, were with a 20sec. wood time fuze unbored, a similar fuze bored to 2·8in, and another fuze of the same kind unbored. The times to the first graze were 14·0sec., 14·4sec., and the first graze were 14 0sec., 14 4sec., and 14 1sec. In the fourth and sixth rounds, the fuzes did not act; in the fifth, however, the burst took place upon impact with the sand.

The seventh was an unbored fuze, with a cravat of quick-match tied round the top of the fuze to insure ignition, which, however, did not take place. Numbers eight and nine did not take place. Numbers eight and nine were bored 2 6in. and 2 8in. respectively; the first burst 30ft. above the plane of the range, and the second on impact with the sand.

Colonel Boxer's fuzes were tried in rounds ten and eleven, and both burst on impact on the sands, the grazes being at 14 Isec. and 14 Osec. Round Number twelve was with Three holes had been a Pettman's fuze. Three holes had been bored through the steadying plug, to act as air passages, to assist the recession of the steadying plug after the fuze was put in action by the firing of the howitzer charge. The fuze, however, did not act. The powder charge was now increased to 6lb. for the next two charges, which were the first with a two charges, which were—the first with a Pettman, and the second with a Boxer fuze. The graze took place at 20 4sec. with Pettman's, but the fuze did not act, whilst Boxer's burst on impact with the sand.

In the second series of experiments, the howitzer was at an elevation of 15deg., and was fired with 10lb. powder charges. Rounds one and two were with Pettman fuzes; the one and two were with 1 certain time of flight was 12.3sec. in each case, and time of flight was 12.3sec. in each case, and the impact with the sand. The both burst on impact with the sand. The third and fourth rounds were with Boxer fuzes, which also burst on impact after flights of 12 1sec. and 11 8sec. respectively. A shell was next filled with sand to 200lb. and fired, plugged with a 20sec. wood time fuze, for the purpose of ascertaining the time of flight of purpose of ascentaining the time of such a missile fired with howitzer charge of such a missile fired with howitzer charge of 25deg. The 10lb. of powder at an elevation of 25deg. The time of flight was ascertained to be 19.9 sec. After this the fuzes were further tested by firing into earthwork at 800 yards from

service charges, namely, for the 12-pounder 8oz., and for the 40-pounder 1lb. 1oz. r.l.g. powder. Shells with reduced bursting charges. The practice was made with Boxer fuzes, Mr. Pettman having withdrawn his from the trials for further modification. Of the first five rounds, two were at 7deg., one at 7deg., and two at 8deg. of elevation. The first shell burst on graze short of earthwork; the second grazed short, ricocheted over earthwork into sea, blind. The third burst on graze 20 yards short, whilst the fourth and fifth hit the work and burst. Five more rounds were then fired at the respective elevations of 9, 10, 101, 101, and 101 deg. The first shell grazed 100 yards short, blind; the second grazed 40 yards short, blind; the third grazed 30 yards short and burst; the fourth grazed to left 40 yards short, blind; and the fifth grazed 100 yards short and ricocheted into the sea, blind. This concluded the experiments, which proved the inefficiency of the Pettman fuzes. The results of the firing upon the howitzer were also unsatisfactory. Being made of Marshall's iron, the bruising of the studs of the heavy projectiles upon the soft metal, even with the low charges of 3lb., considerably injured the rifle grooving. So much is the piece injured, that it will probably have to be returned to the gun factory to be fitted with a Firth's steel tube. These fitted with a Firth's steel tube. results are not altogether so satisfactory as were anticipated, or as could be desired.

### INDO-EUROPEAN TELEGRAPH.

THE progress towards the completion of this line is of so satisfactory a character as to render almost certain its being finished and in successful working order within the time specified in the contract. sidering the numerous engineering culties in the way, this result cannot but be considered as very favourable. It may be in the recollection of our readers, that this scheme was projected last year, for the erection of a double line of telegraph between England and Teheran, in Persia, so that, in connection with the Persian Gulf cable, we might possess an uninterrupted line of telegraphic communication between this country and our Indian possessions, with the great advantage, that, although passing through three foreign countries, this line of telegraph, by virtue of the several concessions, would, for all practical purposes, be in our own hands, and under our own system of manipulation. Such a result must contrast favourably with the present system of telegraphic transmission through the many countries messages now pass. Starting from London, the line may be considered complete as far as Nordeney, for, for that distance, two existing wires are leased from the Electric Telegraph and Reuter's Telegram Companies (the speedy transfer of these two companies to the Government in no wise interfering with these leases). From Nordeney to Thorn the two wires are being constructed by the Prussian Government, and there is every probability of this part being speedily completed. There being no engineering difficulties in the way, carriage and transport being easy, this section requires no further notice; but from Thorn, on the Prusso-Russian frontier, the difficulties to be encountered are somewhat numerous, and deserve some mention.

The great difficulty throughout has been the question of transport, the out-of-the-way ports, and subsequent scarcity of carriage to the required points. In some sections, iron posts are used, whilst in others, the native

having to be floated down the rivers on the breaking up of the ice.

The next section is from Balta via Odessa to Kertch (through the Crimea), to Ecater-neador, and thence to a point on the Black Sea (near Djuta), the northernmost end of the Black Sea cable. This section is about 750 miles in length, and includes two heavy cables, one crossing the Straits of Kertch, a length of 15 miles, and the other, a length of about 4 miles, across the Dnieper; the construction of this part will be of iron posts, those known as Seimens', all of which, with the necessary materials, have been forwarded, but owing to the severity of the winter, they had not, according to our latent accounts, been distributed. The cable from near Djulfa to Suchum Kale will be a three-wire cable of about 100 miles in length; the conductors are of the usual size stranded wire, 107lb. to the nautical mile, covered with alternate layers of Chatterton's compound and gutta-percha, to the weight of 166lb., making a total weight of 273lb. per knot. These three conductors are laid up together and covered with hemp, having for external protection four strips of thin copper laid round helically on Mr. Siemens' patented plan, this having for its special recommendation the freedom from injury by the "teredo," and from corrosion by sea water. The insulated conductor is being made at the Gutta-Percha Works, Wharf-road, and the cable, as well as the smaller sections, is being sheathed at the cable works of Messrs. Siemens, at Charlton. ends of the Black Sea cable are to be sheathed with heavy galvanized iron wires, protected by tarred jute; this cable it is expected will be submerged in June next. From Suchum Kalé, the land line proceeds via Tiflis to Djulfa, a length of 570 miles, and from Djulfa to Teheran, a length of 450 miles. For the line from Suchum Kalé, the iron posts and material were shipped to Poti in the Black Sea, and from that port a difficulty of transport was found. In one part, across the Surat Mountains, a way had to be cleared through original forests, by hewing down trees and brushwood, but in spite of the many difficulties, the work is progressing satisfactorily. For the section from Djulfa to Teheran, the material was forwarded via Russia down the Volga to the Caspian Sea, and so to the Persian ports at the south of the Caspian; the difficulties of transport in this case into the interior were not so much from the nature of the country as from the This scarcity, scarcity of beasts of burden. through good organization, has been neutralized, and it is expected by the end of July this section will be completed.

The contractors for the whole line are the Messrs. Siemens, the most experienced of all telegraph constructors, and, from the amount of work already previously executed by them, and from the excellent manner in which their work is usually carried out, we may fairly expect this work—so large and so extensive, encountering so many difficulties—to be as perfect a system of overland telegraph as modern engineering is capable of constructing. Of the quality of the materials, Mr. C. W. Siemens, in his report to the directors, mentions, "It is, however, very important that the line should be constructed of such materials as will ensure its permanency under the most varied circumstances of climate, and without involving the necessity of frequent repairs. For this purpose, iron posts of great strength, wire of unusual thickness and tenacity, and insulators of superior construction, have been selected under the concurrent advice of the three official directors

Government have determined to improve their lines from Teheran to India. lines proceed from Teheran via Ispahan and Shiraz to Bushire, on the Persian Gulf, from thence by submarine cable to Kurrachee. From Teheran the wooden posts now in use are to be replaced by Siemens' iron posts; and a submarine cable of about 500 miles will be laid from Bushire to Jask; and from Jask to Kurrachee the land line will be extended and completed; so that, through the Persian Gulf there will be two cables between Bushire and Jask, and from that point to Kurrachee, a cable and a line, thus giving us a double communication through the whole extent of the Gulf. The cable intended for the Persian Gulf has been, as we previously informed our readers, manufactured, and was shipped on board the ships "Calcutta" and "Tweed." The accident to the former, necessitating the postponement of the expedition, is of too late occurrence to necessitate our recalling it; but, in spite of the unavoidable delay, the cable will be laid, and the alternative communication be completed be-fore the "Indo-European" line. It is, however, satisfactory for us to be able to announce that the 70 miles payed out from the "Calcutta" after her collision has been entirely recovered, through the skill and ability of Mr. F. C. Webb, C.E., who was specially sent out to dredge and to endeavour to recover what he could of the lost cable.

As the present article is intended to deal purely with the projected means of communication to India by this route alone, we do not refer here to the other projects that have been brought forward for a similar purpose, our object being to lay before our readers some account of the special features of the overland Indo-European telegraph. On the completion of the line, it is intended to work the line by means of a new automatic instrument recently patented by Messrs. Siemens: and they are not without the hope of working through, from London to India, without manual transmission—a "consummation," we say, "most devoutly to be wished." We have watched this scheme from the commencement with lively interest, and shall continue to do so; and, as the works progress, will endeavour to keep our readers well informed; and, on its completion, we trust to be able to furnish some details as to construction and working that cannot fail to be interesting.

# MANUFACTURE OF CAPS AND CARTRIDGES. No. V.

N our last article we had arrived at the stage in which the fulminate of mercury was transported to the first of the sheds, where the minor operations of converting it into a detonating substance were commenced. In certain proportions with nitrate of potash, it is reduced, by mixing, to the consistency of a thin semi-fluid paste, and while in this condition it can be safely manipulated upon a table constructed with a false bottom. During winter, a jet of steam circulates through the space so formed in the table. After bruising the paste with a roller, it is transferred to another shed, and deposited upon frames covered with unsized grey-coloured paper, which abstracts all the superfluous humidity. So soon as it is half dried, it is passed through a sieve of large meshes, from which it falls in a series of small threads, resembling vermicelli. These, in becoming still drier, change into greyish-coloured grains which are received in a graduated glass, which is grown timber has been made use of. The section from Thorn to Balta via Warsaw, about 800 miles in length, will be constructed with heavy timber, the posts being of oak, 27ft. in length by 6½in. diameter at top; all this timber has been felled, and a large part carried to its destination, the mode of transport being by means of aledges, the remainder of the section from the timber has been insured by the adoption of the tests during their manufacture." On the completion of the above double-wire system, it is but fair to expect improved communication with place the whole route port being by means of aledges, the remainder of the section from Thorn to Balta via Warsaw, and a high quality of these closed with a very smooth description of cork, resembling what is usually termed "velve" cork." A spherical form is imparted to the grains, by means of a rotatory motion very carried to its destination, the mode of transport being by means of aledges, the remainder of velves and the section from the time of velves distinct or the time of these once in a graduated glass, which is closed with a very smooth description of cork, resembling what is usually termed "velves" cork." A spherical form is imparted to the grains, by means of a rotatory motion very carried to its destination, the mode of transport of the above double-wire system, it is but fair to expect improved communication with places. The closed with a very smooth description of cork, resembling what is usually termed "velves" cork." A spherical form is imparted to the grains, by means of a rotatory motion very carried to its during the above double-wire system, it is but fair to expect improved communication with places. table silk. These frames are carried into another shed which contains large copper cylinders heated by steam, thus constituting it a drying room. The walls of this apartment are furnished with shelves or brackets to receive the frames, and when the powder is sufficiently dried, it is transported into a fourth shed, similar in appearance to those through which it has already passed in the process of manufacture, and which is protected by the same precautions. Here it is sifted through a sieve of skin, perforated with small holes, which allow the smaller grains to fall through, but arrest those of larger size. These are collected and remixed with the pasty mass, constituting a succeeding preparation. The smaller grains are sifted through a second sieve, having still narrower meshes, and the same result ensues. Some pass the meshes, while others are retained. In this instance, however, it is not the larger grains which are arrested by the sieve that are sent back to be mixed up with the paste, but the finer which fall through. Those that remain on the sieve are of the size required. They constitute the detonating powder intended to fill the caps, and by means of a paper funnel are poured into large bottles, constructed especially for the purpose.

So far, ordinary care and precaution in the manipulation of the powder will suffice to ensure the protection and safety of the workmen employed in its manufacture, but in the succeeding operations it is impossible to use too much discretion. This is entailed in consequence of the extreme degree of dryness now bestowed upon the substance, the danger and humidity being regarded in inverse ratio to one another. The bottles, with the contents that are the results of the day's work, are every evening deposited in a sort of cupboard with iron shutters, or, as it might be correctly termed, a powder-proof press or safe. This safe is recessed in the casemate, which forms the protecting barrier between the workmen and the manufacture of the fulminate, and communicates with an exterior cylindrical passage covered with a layer of asphalte, in a manner similar to that already alluded to, as forming the coating of every medium by which the powder is conveyed from one spot to another. When it is re-quired to transfer some of the fulminating powder from the safe to the workshop, it is placed in gutta-percha bottles, which, however, are not permitted to be carried into the workshop, as the danger of explosion, and especially the consequences of such a catastrophe, increases obviously with the quantity or mass. The only person allowed to handle the powder is the foreman, who, after the gutta-percha bottle has been deposited in another, or, rather, in a kind of round box constructed of thick plate iron, with the greatest possible care, takes it up and pours out a certain quantity into another box. The dimensions of this lastmentioned box are 61in. by 31in. filled, it is placed upon an iron stand, which is separated from the rest of the workshop by a large and strong iron screen. A hole is bored about the middle of this screen, oppo-site to which is placed the small box filled with powder in the manner just described.

In each of these filling rooms there are but four persons at the most. The copper caps, with their cavities uppermost, are first of all placed by a woman in an iron holder pierced with ninety-eight holes, and opening by means of a hinge-joint. When furnished with caps, a workman takes them and pushes them through the hole in the screen under the box filled with powder. The manner in which the caps are filled is very ingenious. The box has a double bottom perforated with holes which are not opposite to one another. In the space thus formed, a plate, also perforated with holes, traverses backwards and forwards. Supposing the plate to be in its normal position, or that in which it fits in the

space, its holes correspond with those pierced in the upper bottom of the box, and it consequently receives a certain quantity of pow-der regulated by its own thickness. If the plate be now pushed forwards, those portions of its surface which are not perforated stop up the holes in the upper bottom of the box, while its own holes are now opposite or over those pierced in the lower bottom of the box. At this juncture, the holder furnished with the caps comes exactly under the holes, so that the cavity of the caps corresponds with them to a nicety, and they therefore receive the powder through them, the quantity of which forms the proper dose for each cap. The workman now draws out the holder and hands it to the foreman, who places it under a balance. A plate descends with the movea balance. A plate descends with the move-ment of the balance, carrying upon its lower surface as many small punches as there are caps in the holder. These punches are re-cessed a little at the points, and, by the descent of the balance beam, compress the powder, which takes a slightly conical shape, corresponding to the cavity in the punch.

Some of our readers will probably be surprised, particularly after what has been stated respecting the danger of explosion, that the pressure of the punch does not cause the fulminate to explode. A distinction must be here made between a pressure and a shock or blow. Frequently, the slightest shock will cause a detonating mixture to explode, but it will nevertheless stand a very strong pressure gently applied. As a proof of the correctness of our statement, we may refer to an explosion of fulminating powder which recently took place at Messrs. Kynock's cartridge and per-cussion cap manufactory, Aston, near Bir-mingham. A number of girls were engaged in one of the processess connected with the preparation of cartridges. A number of these cartridges were being dried upon a hot slab, and one of the girls was brushing them off quickly with her hand, when the friction with the slab caused an explosion. Five girls were much burned in their faces. Formerly, it was the practice to fix the powder in the caps by the application of a drop of varnish; but since it has been demonstrated that it will support without explosion a direct pressure of forty atmospheres, there is no necessity for any other method of accomplishing that result than the pressure of the punch. To obviate any chance of a shock being communicated to it in the operation of compressing it in the cap, the apparatus is covered by a strip of thick leather.

The filling of the caps intended for cartridges to be used in small arms, which are manufactured for the purpose of saloon practice, is effected, with some trifling modifications, in the same manner, to which we shall allude in our next.

# INSTITUTION OF NAVAL ARCHITECTS.

THE next paper we have to mention is one read by Mr. J. Scott Russell, "On Railway Communication across the Sea." This paper we may fairly divide into two parts, one being a joyful account of what has already been accomplished in Switzerland, and the other being full of "lamentations and mourning" over what has not been accomplished between England and France. Mr. Russell has lately been engaged in superintending the construction of what we may call a steam ferry across the Lake of Constance, from Romanshorn to Friedrichshafen, to connect the railways of Switzerland, on the one shore, with those of Wurtemberg, on the other. The ferry boat is on the model of a railway station, with two lines of rail. A drawbridge, which allows for a rise and fall of something like 10ft. of water in the lake, connects the rails on the ferry boat with those on terra firma. No mechanism is required

for lowering the train on to the ferry boat, or for raising it on the other side, but the ordinary locomotives; in fact, the locomotive has sufficient power in its brakes to embark itself with ease and safety, and sufficient power to disembark as easily. The ferry boat is roofed in with a kind of upper deck, which forms one of the chief sources of strength in the whole structure, and affords a pleasant promenade in fine weather. The boat is fitted with paddlewheels, which are, however, detached, and are worked by different engines. This enables the steering of the ferry boat to be regulated with the utmost nicety, and contributes largely to the success of the undertaking. This will easily be seen when we say that the draught of the boat is about 6ft., and that at times there is not more than 6ift. of water in the harbour, and that the harbour, moreover, is very narrow and tortuous.

From the success which has attended this undertaking, Mr. Russell argues that an equal success probably would attend a similar undertaking for crossing the Straits of Dover. There is scarcely a difficulty to be apprehended in applying this method of intercommunication between England and France, that has not been encountered and overcome on the Bodensee. The chief difference is, that while on the inland lake we meet with sudden squalls, which beat up the surface of the water into an angry sea of short sharp waves, the twenty miles between Dover and Calais are open to the long heavy swell that follows an Atlantic storm. The importance which attaches to the intercommunication between England and France is of such magnitude that any means of increasing the facility of intercourse would be met with favour. This seems a very feasible method, and we think that an attempt should be made to connect the railway systems of the two countries in this way, before several millions are thrown away on any of the extravagant schemes for throwing bridges across the Channel, or of tunnelling beneath it.

Captain Selwyn, R.N., who seems to take a pride in his profession, and an interest in all connected with it, favoured the Institution with a paper "On Liquid Fuel," a subject on which he has written before. Experiments were made about a year ago, by the Admiralty, on liquid fuel. A boiler was fitted to a steam launch, for the purpose of these experiments. This boiler, during a trial of 73 hours with coal, evaporated 7.06lb. of water per 1lb. of coal per hour, and during a trial of 33 hours with oil, it evaporated 10.32lb. of water per 1lb. of oil per hour. In these experiments the furnace is fed by an injector, formed of two pipes, of which the inner one supplies the oil, while the outer is connected with the boiler. This is the Wise, Field, and Aydon principle which has often been referred to in our pages. The steam from the boiler, besides, perhaps, performing other useful offices, throws the oil into a fine spray—a form very conducive to complete and rapid combustion. The best arrangement seems to be to supply equal weights of steam and oil. There is another way of burning the oil, made use of by Messrs. Dorsett and Blyth, with which our readers are also familiar. The oil is heated in a retort till it takes a gaseous form, and it is then burnt, like ordinary gas, issuing from a series of small apertures in a coil of iron pipe. No steam is required in this method, but Captain Selwyn prefers the other, on account of its simplicity, there being little or no difference in the calorific effect produced. The advantages attending the use of this kind of fuel are so manifest that we are surprised that it is not making even more rapid strides than we see it actually making. The furnace requires no watching. When once lit it will burn for days and weeks without

a couple of taps. It might, at first sight, be supposed that danger attended the use of this fuel. Several persons have had their whiskers singed and their faces scorched, it is true, from explosions taking place in the furnace. However, in all cases, the sufferers have acknowledged that it was their fault, and have shown no apprehension of a similar accident happening a second time.

We now come to a paper by Mr. Reed, the Chief Constructor of the Navy, the subject of which was "Long and Short Iron-clads." This paper was prefaced by a statement of the length and breadth of the longest of our wooden line-of-battle ships and frigates, and some of the ironelads. It appears, from this, that the "Warrior," which is 380ft. long is 80ft. longer than the longest of our wooden frigates. The object sought in adopting this extreme length, was the driving a great weight of hull at a good speed, with proportionally moderate engine This end, Mr. Reed allows, was successfully accomplished; but, he asks, "Don't you pay away with the one hand what you receive with the other?" His own opinion he gives in these words:-" It is unwise to make an ironclad very long, large, costly, and unhandy, in order to effect a comparatively small saving in the engine power."
It has been Mr. Reed's duty to design ships of much more moderate dimensions. The "Bellerophon" may be taken as the type of the new class of "short ironclads." Its length is 300ft. The official reports on the experience with the two classes tell us that the short ships, with a slight increase of engine power, attain as good a speed as the long ships; that in turning power and general handiness, whether under steam or sail, the short ships have a decided superiority. while the great saving in the prime cost of the hull much more than compensates for the increased cost of engines.

Scientic writers, Mr. Reed remarks, generally ignore the weight of the hull of a ship, when discussing the form of water lines best suited for given speeds. This, of course, must lead to error. A merchantman may advantageously be long and fine, but in an ironclad, whose whole length must be armoured, an increase in length leads to a corresponding increase in the armour to be carried. An instance will better point out the conclusions which should be drawn from this fact. No less than 80ft. of the bow of the "Minotaur" is only partially water-borne. The excess of weight over buoyancy of this portion is 420 tons, and to carry this we require an increase of 13in. in the immersion of the water-borne midship portion of the vessel. This augments the area of the midship section, and in consequence the necessary engine power. Could not the same end be gained by a shorter and bluffer bow, which would allow of a decrease in the midship section? The answer to this query may be collected from the following fact:—In a six hours' run at sea, the "Minotaur," which had been out of dock nine days, made 14:165 knots, with 6,193-horse power, and the "Bellerophon," which had been twenty-one days out of dock, made 14.053 knots, with 6,199-horse power. This is a sufficient proof that there is very much in Mr. Reed's arguments, and a perfect justification for building the new class of ironclads.

Mr. Reed thinks that our experience warrants the assertion that "in armoured ships, as the extent and thickness of the armour to be carried are increased, the proportion of length to breadth should be diminished, and the fullness of the waterlines increased, and that the shorter fuller ship can be propelled at as great a speed as the longer finer ship, with about the same, or a little greater, horse power." As it is not possible to do justice to Mr. Reed's paper in a short abstract like the present, we have reproduced it verbatim on another column.

NOTES ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL APPLICATIONS.

THE ARTIFICIAL FORMATION OF ALIZARIN—TO
DETECT ULTRAMARINE OR ANILINE BLUE IN
WHITE SUGAR—A CEMENT FOR JOINING LEATHER
—LEATHER OIL.

YNTHETIC chemistry, the chemistry which occupies itself with the artificial production of bodies which are formed by what we may call natural processes in plants and animals, has made wonderful progress within the last few years. Among the most important of the triumphs in this branch of science, we may mention the artificial production of tartaric acid, the acid of the grape, and of coumarine, the odoriferous principle of the tonquin bean, by our countryman, Mr. Perkin; and also of sugar, or, at all events, a substance closely resembling sugar, by Carius. These are but a few of the remarkable discoveries made by chemists, who have engaged themselves with this line of research; but they serve to show the direction which the labours of some of our most advanced and intelligent chemists take. To-day, we have to record another brilliant discovery of this kind—the artificial production of alizarin; the principal colouring matter is madder root. It is not, however, the first time that the artificial production of this body has been announced. Some years ago, M. Roussin discovered, that by treating naphthaline with concentrated sulphuric acid, and a reducing agent, a deep red colouring matter was formed, which dyed mordanted cotton like alizarin, and the discoverer concluded that he has actually produced alizarin. Further research convinced him that he had made a mistake, and the colouring matter (now known in chemistry as naphtharazin), only producing dull colours, receives no applications. It is now announced that Graebe and Liebermann have succeeded in the production of alizarin from anthracene. This naphthaline, is found in the heavy semi-fluid portion of coal tar. As separated in an impure state, it is a yellow, soft, butter-like substance, but, when purified, it is obtained in colourless plates, with a silky lustre, very like naphthaline in appearance. Its relation to alizarin will be seen by a comparison of the formulæ of the two bodies.

C 14 H 10 C 14 H 10 O 4

Anthracene. Alizarin.

It is right to mention that the formula of alizarin, given above, is that assigned to it by Dr. Schunck. Other authorities ascribe to it the numbers C<sub>10</sub> H <sub>6</sub> O <sub>3</sub>, and, if these be correct, Other authorities ascribe to it it is difficult to see how it could possibly be formed from anthracene. The formula of the artificial alizarin is said to be C<sub>14</sub> H <sub>8</sub> O <sub>4</sub>, which represents the abstraction of two equivalents of hydrogen, and the addition of four equivalents of oxygen to the anthracene. We are not yet fully informed as to how this alteration is effected, but we are told that the artificial colouring matter comports itself exactly like the natural, and gives colours in every respect the same. Such discoveries as this are of immense importance, in a scientific point of view. Commercially, they are at present of little interest. Alizarin can be obtaine madder at far less cost than it can possibly be made from anthracene. But such transformations throw a light on the secret operations of nature, and point to a not far distant day, when man will be able, from simple inorganic materials, to build up for himself the most complex productions of organic life.

Continental sugar refiners have borrowed a notion from the laundress, and give an appearance of whiteness to their product by the judicious use of a little blue. Indigo has been employed for this purpose, but now, it is said, that artificial ultramarine, and also aniline blue, are occasionally used. To detect these, Dr. Reimann recommends that the sugar be dissolved in a small quantity of water, and the solution be allowed to stand for some time, whereupon the blue matter will settle at the bottom of the vessel. The deposit is to be separated, and then treated with diluted hydrochloric acid. If the blue colour is destroyed, and an odour of sulphuretted hydrogen evolved, the colouring matter is ultranarine. If the colour remain, the solution is to be filtered, and the deposit shaken up with some alcohol. Then, if a blue solution be obtained, the colour is aniline blue. It is as well to say that in either case the colour is quite harm-

less, and no one need be afraid to eat sugar a coloured.

A cement for joining leather, sufficiently strong to be used for driving belts and boot soles, may be found extremely useful. Such a cement is said by Stubenrauch to be made by mixing ten parts of bisulphide of carbon with one part of oil of turpentine, and dissolving in the mixture sufficient gutta-percha to produce a thick treacly fluid. Before it is employed, the surfaces of leather to be joined must be carefully freed from grease, and smoothed with a hot iron. The cement is then laid on both surfaces, which are now placed together, and kept firmly pressed until the cement is perfectly dry. It is obvious that boots, with soles stuck on in this way, must not be put near a fire.

In connection with this, we may mention Dr. Schwarz's account of a preparation extensively used in Germany for softening leather which has become hard. It is known as "leather oil," and is made, under the direction of Dr. Wiederhold, at Cassel. According to Dr. Schwarz, it is a mixture of oleic ether and train oil, scented with nitrobenzol, and may be prepared as follows: -Sixteen parts of eleic acid are mixed with two parts of strong alcohol, and then heated with one part of strong sulphuric acid, under suitable circumstances—that is, the vessel should be large, the acid should be added very gradually, and the mixture should be kept well stirred. On standing, after the mixture has become cold, the oleic ether will separate as a thinnish brown It must be decanted, and washed with warm water, to free it from sulphuric acid and excess of alcohol. Then it is mixed with an equal weight of train oil, and some nitrobenzol added to cover the bad odour. This preparation, we are told, penotrates the leather very easily, and gives it a remarkable suppleness. If not identical with the original, Dr. Schwarz states that it answers the purpose just as well.

# LONG AND SHORT IRONCLADS. By Mr. E. J. Reed, C.B.

In the design of our earliest ironclad frigate, the "Warrior," dimensions and proportions were adopted far exceeding those of the longest and finest wood ships which preceded her. The "Minotaur" class, designed in consequence of the desire to obtain complete protection, have even a greater proportion of length to breadth than the "Warrior," and are considerably larger; but in them, as in the "Warrior," economy of steam power was one of the great features of the design. Our more recent ships have less extreme proportions and dimensions, and in their design economy of steam power did not occupy, by any means, so prominent a place. Before proceeding to discuss the relative merits of long and short ironclads, however, it may be well to give the lengths and proportions of a few of our principal ironclads, and to compare them with those of our longest and finest wood-ships.

Ships.	Length.	Breadth.	Propor- tion.
Unarmoured:	ft. in.	ft. in.	
Longest three-deck line- of-battle ships Longest two-decked line-	260 O	61 0	4.3
of-battle ships	254 9	55 4	4-6
Longest frigutes	300 0	52 0	5-8
Armoured:			ĺ
"Warrior"	380 0	58 4	6.5
"Minotaur"	400 0	59 4#	6.7
"Bellerophon"	800 0	56 1	63
" Hercules "	325 0	59 0	5.5
"Monarch") turret	330 0	57.6	5.7
"Captain" ships	320 0	53 0	6-0

From these figures it will be seen that, in consequence of the armour plating of about 213ft. amidships, the "Warrior" was made 80ft. longer than the longest wood ships; and that complete protection in the "Minotaur" was thought to require an additional length of 20ft., making 400ft. in all. There can be no question that the objects kept in view by the designers of these ships—the carrying of a large weight of armour on a hull so formed as to be driven at a high speed with a proportionally moderate engine power—were very satisfactorily attained. The question arises, however, whether the objects on which the designs were based were themselves wise. My own opinion on the subject is well known, and may be briefly summed up in the statement that it is unwise to make an ironclad very long, large, costly, and unhandy, in order to effect a comparatively small saving in the engine power. It has been my duty to carry into practice principles of design totally opposed to those exemplified in the "Warrior" and "Minotaur."

The new method of design received its first

<sup>\*</sup> Read before the Institution of Naval Architects.

illustration in the "Bellerophon," and in that vessel has undergone a series of trials, the results of which are of a most satisfactory character. It has also been applied to the "Lord Clyde" and "Lord Warden," which are 280ft. long and 59ft. broad, the proportion of length to breadth being about 4½ to 1, and in these short, bluff, completely protected ships, has proved quite as successful as in the "Bellerophon." All our recent ironclads have similar moderate proportions, and the ship last tried, the "Hercules," has afforded another, and most striking, illustration of the benefit resulting from this course. Our experience with long and short ironclads, and the official reports of trials of speed and turning power, may, I think, be fairly stated as follows:—That the short ships may be driven as fast as the long ships by a moderate addition to their engine power; that in turning power and general handiness under steam and sail the short ships are much superior, and that the great reduction in the prime cost of short ships much more than makes amends for the addition to the steam pewer. In thickness of armour, and in character of armament, I need hardly say that the more recent ships are superior to the long ships first built. Without discussing further the actual trials of long and short ironclads, I shall proceed to consider the subject from a more theoretical point of view. Scientific writers upon the forms and resistances of ships have generally recommended the adoption of forms of least resistance; and have taken no account whatever of the effect which the weight of the material in the hull should have upon the form of a ship. The most cursory glance will, however, be sufficient to show that this generalization cannot include the designs of all ships. Take, for example, the vastly different conditions to be fulfiled in a merchant ship and in an ironclad war ship. The former is designed to carry cargo economically, and the weight of hull forms a comparatively small function of the total displacement; while th

to a corresponding increase in the area of the surface to be armoured, and in the unproductive weight to be carried; while a reduction in the length leads to a considerable decrease in that area, and in the total weight of armour.

The impossibility of correctly prescribing any general form of ship, in disregard of the armour, will exhibit itself even more strikingly if we consider independently ene end of a ship, say the bow or entrance. To fix our ideas, we will take the case of the "Minotaur," for which ship it has been found by actual calculation that in still water the weight of the first 80ft. of the bow exceeds its displacement by about 420 tons. This excess of weight must clearly be floated by the central part of the ship, where the buoyancy exceeds the weight, and the length of this part being 250ft., while its mean breadth is about 76ft., its immersion must be increased by about 13in. In consequence of the unsupported weight forward This additional immersion increases the area of the midship section which has to be propelled through. The water by from 60 to 65 square feet. Now, let us imagine this bow to be so shortened and shaped—on the one hand increasing its buoyancy, and on the other diminishing its weight—as to produce an equilibrium between its total weight and buoyancy. No doubt by making it bluffer we shall increase its resistance to motion through the water, but we shall at the same time lighten the burden upon the central part of the ship, and reduce the total area of the midship section to be driven as well as the total weight. It is easy to see that by this means we may succeed in getting the same speed with a given power, as would have been obtained by employing the longer and finer, but much heavier bow. This is the essence of the principle which I have laid down, and carried out in practice.

In the design of all merchant steamships the conditions to be fulfilled area os similar, and the proportion of weight of hull, equipment, and carried out in practice.

In the design of all merchant

say, estimated from the two formulas,

(Speed)<sup>3</sup> X Midship Section Immersed

Indicated horse power

(2) Constant= (Speed)<sup>3</sup> ×(Displacement)
Indicated horse power

These formulæ are always used in calculating the results of the trials of ships of the navy. In them it is assumed (1) that, within certain limits, the resistance to a ship's motion varies as the square of the velocity, and that, therefore, the propelling power must vary as the cube of the velocity; (2) that the resistance also varies, cateris paribus, as the area of immersed midship section in the first formula, and as the two-thirds power of the displacement in the second formula; (3) that the indicated horse power bears a constant ratio to the useful work of the engine, i.e., to the power actually available for propulsion. These assumptions are incomparing performances, and in determining the engine power needed in a new design.

I may remark in passing that the method of calculating the horse power just referred to is much surprise when it is remembered that the difficulties of surprise when it is remembered that the difficulties surprise when it is remembered that the difficulties of surprise when it is remembered that the difficulties surprise when it is remembered that the difficulties of the hand, a glance through the elaborate table of the sections ship, similar in form and proportion to the new design, and from the constants obtained by this ship to calculate the horse power required for the estimated speed, with a very fair amount of accuracy.

While recognizing the value of the constants, that the

the estimated speed, with a very fair amount of accuracy.

While recognizing the value of the constants, however, I cannot entertain the opinion that they should form the sole standards by which all steamships, armoured as well as unarmoured, should be judged. Such an opinion virtually amounts to a belief that the chief aim of the naval architect ought to be the lowering of the proportions borne by the indicated horse power to the speed attained, to the midship section immersed, and to the displacement. As far as form alone is concerned, this view is no doubt correct, but obviously, if carried out in its entirety, it would lead to the construction of ships that would carry no weights except those of the propelling apparatus. This is, of course, an extreme case, and it may be thought unfair to argue from it the folly of the system as a whole. But if economy of steam power is the chief desideratum in ship design, the case imagined is also the fullest development of the principle; and if we once admit other considerations besides form—such as cargo-carrying power, first cost, and handiness—the failure of the constants as criteria is tacitly acknowledged.

There can be no doubt that in merchant ships increased proportions and fineness of form have led.

constants as criteria is tacitly acknowledged.

There can be no doubt that in merchant ships increased proportions and fineness of form have led, and do lead, to increased carrying power, and to economy of steam power; and that in such cases the constants of performance have higher values. The lightness of the hull would, in my opinion, tend to produce these results, and I have previously stated that for merchant ships—and it is true also for unarmoured war ships—the constants are very fair standards of excellence. But with ironclad ships, if a similar mode of comparison were followed, we should in many instances be comparing vessels of which the armour was of extremely different degrees of efficiency, and should, at the same time, wholly exclude this important fact from our consideration.

ration.

For example, if the "Warrior" and "Bellerophon" were compared, we should have the former with comparatively thin armour plating extending over a little more than half the length; and the length at the water-line, besides having armoured central and bow batteries. It would obviously be most delusive in comparing these ships to waive all consideration of these facts and to take constants of performance as the sole criteria. In fact, such a course would be equivalent to requiring that the proportion of weight of hull (including armour) to the displacement should be considerably greater in the shorter than in the longer ship. At the same time the other most important points connected with first cost, character, and weight of armament and handiness, would be entirely neglected.

In short, constants of performance can only be of

In short, constants of performance can only be of use in comparing the merits of two ironclads when there is similarity, or at least equality, of construction, armour, and armament; and when this condition is satisfied, the conclusions based upon the values of the constants must be supplemented by considerations of cost and handiness. The merits of ironclads ships do not consist in carrying a large proportion of weights to engine power, or having a high speed in proportion to that power; but rather in possessing great powers of offence and defence, being comparatively short, cheap, and handy, and steaming at a high speed, not in the most economical way a high speed, not in the most economical way a high speed of norder to decrease the weight and cost, adopted in order to decrease the weight and cost, and to increase the handiness. It must be obvious that if a ship 300ft. long, plated all over with given armour, carrying a given armament, and costing say armour carrying a given armament, and costing say armour cost of the speeds attained having alone the time of trial having been neglected. Such a tent that on this, the previously described always should et ala 400ft. should have alwest. It is in the other hand,

a cost say of £380,000 for no other object than that of driving the greater weight at the same speed with about the same power; in other words, for the mere purpose of raising the constants.

It may, perhaps, be objected to this statement that the trials of actual ships do not show that a ship 300ft. long can be driven at the same speed, with about the same power as a ship 400ft. long, when the armour is equally efficient in the two ships. Now, I need hardly say, that in dealing with speed trials great care is required in order to ensure a fair comparison of the performances of any two ships. So many causes of difference exist, that until it is known that they are either inactive, or else acting similarly, in the ships compared, the comparison is of little worth. The quantity of the condition of the engines, and the state of the bottom, as well as the force of the wind and condition of the sea, are the chief causes of error in such comparisons; and the reports on the performances of our ironclads prove that greater varieties of speed are due to these, so to speak, secondary causes, than are shown to exist when the ships are first tried on the measured mile. This is a most important fact, requiring to be borne in mind when the policy of our naval construction is being discussed; for the present I only refer to it as connected with the speeds actually attained on trial.

With these prefatory remarks I desire to introduce to your notice the results of a series of

refer to it as connected with the speeds actually attained on trial.

With these prefatory remarks I desire to introduce to your notice the results of a series of trials which took place in the spring of 1868, and which were conducted in such a manner as to eliminate, as far as possible, the effects of these sources of error; care being taken to ensure equally good coal and stoking, the bottoms being cleaned almost immediately before the trials took place, and the engines, as the trials showed, being in excellent condition. The ships tried were the "Minotaur," "Bellerophon," and "Warrior"; but for the present I shall confine attention to the two first-named vessels, as their performances will throw some light on the point now under discussion. It has been found by actual calculation that the weights per square foot of the protecting material—armour and backing—in these ships, when uniformly distributed over the surface of the side from the lower edge of armour up to the upper deck, are very nearly identical: so that it may fairly be assumed that if the "Bellerophon" were completely protected she would have quite as strong armour as the "Minotaur," the excess in thickness of the skin plating in the "Bellerophon" over that in the "Minotaur" being put into armour. Hence, it follows that these ships may be taken as representatives of the 300ft. and 400ft. ships previously referred to.

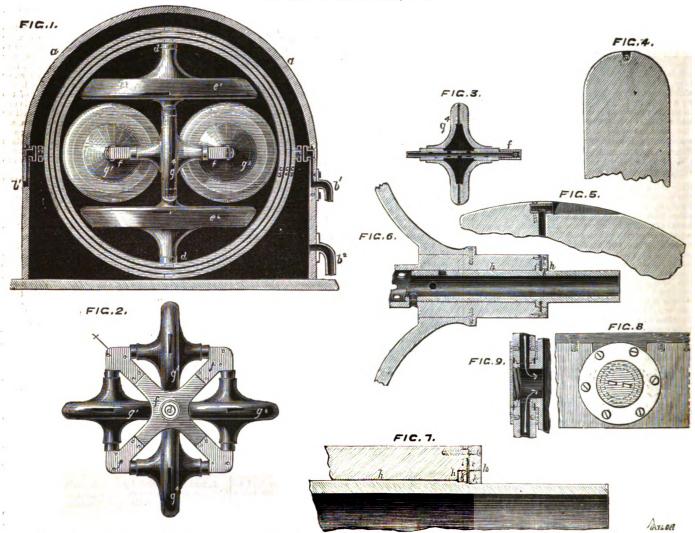
Before being tried by a six-hours' run at sea, the ships were put over the measured mile in Stokes.

Hence, it follows the 300ft. and 400ft. ships previously referred to.

Before being tried by a six-hours' run at sea, the ships were part over the measured mile in Stokes' Bay, where the "Minotaur" attained a speed of 14.411 knots, with an indicated power of 6,702-horse power, and the "Bellerophon" realized 13.874 knots, with an indicated power of 6,002-horse power. With a greater power by 700-horse power by 700-horse power with therefore, the "Minotaur" beat the "Bellerophon' by about half a knot. This trial does not help us much in our investigation, but the six hours' trials are of exactly the right character for our purpose, since on them the indicated horse powers were, as nearly as possible, identical. On this trial, when the "Minotaur" had only been out of dock nine days, she made 14.165 knots with 6,193-horse power; and on a similar trial the "Bellerophon," which had been twenty-one days out of dock, made 14.053 the Navy remarked in his report on these trials, "the 'Bellerophon' had the disadvantage of having been twice as long in the water as the other two ships, and at this time of the year (the spring) the ships, and at this time of the year (the spring) the dentical with that of the "Minotaur," when the identical with that of the "Minotaur," when the other hand, it is right to state that on this, the only occasion when such ships have been tried under principle that 300ft. and 400ft. ships of the character previously described always should steam at the previously described always should steam at the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, the other hand, it is right to state that on this, th Before being tried by a six-hours' run at sea,

# THE WHIRL-WHEEL STAR POINTER.

BY MR. J. F. BOURNE, C.E.



course is obviously incorrect, as the connection between horse power and speed is indissoluble; and it has been truly said that complaints of fallings off in speed, which were really due to smallness of horse power, amount to complaints that the hull did not drag the engines along at a greater rate than that at which they were working. The fact is that all the long ironclads have engines of the old type, which had been gradually improved upon, until—apart from the preat consumption of fuel—it had been made to approach perfection, and not only was the development of the guaranteed power ensured, but in many cases that power was considerably exceeded. The recent short ironclads, on the other hand, have the new type of engines with surface condensers, superheaters, and other novel arrangements, which, like all newly-introduced mechanical contrivances, are liable to occasional failure that could hardly have been foreseen, and can be easily remedied, but that, for the time, cause very mistaken notions of their true character. As experience is gained in the construction and working of these improved engines, they, like the older type, will no doubt be perfected; but, at present, their performance is not nearly of so certain a character as that of the more wasteful type which preceded them. It has happened, in consequence of this fact, that on some occasions the power developed in, and the speed obtained by, our short ships at sea, have fallen considerably below the corresponding results on the measured mile trials; and in published reports of these so-called failures the low speeds have been given without any mention being made of the want of engine power. I have already referred to the unfairness of this course, and need only add that the results of the trials of all the short ships may be summed up in the statement that, when the engine power has reached the amount guaranteed the estimated speed has been attained, but that when the power has fallen off the speed also has necessarily declined. It is not the function

(To be continued.)

THE WHIRL-WHEEL STAR POINTER.

WE illustrate herewith an apparatus which has been designed by Mr. John Fred. Bourne, M. Inst. C.E., with the view of meeting a most important requirement in ocean navigation. It is an instrument for the purpose of indicating the true north, and for ascertaining the latitude and longitude of a ship at sea, with facility and accuracy. The proposition is to avoid all errors accuracy. The proposition is to avoid all errors of the ordinary magnetic compass, by the use of a mechanical pointer, constructed upon the principle of the gyroscope. It is unquestionably a production upon which much time and thought have been expended, and appears to be exactly what is required for the purpose. Whilst giving Mr. Bourne every credit for the ingenuity of his conception, we must observe that it has not yet passed from the realms of theory into those of practice—scarcely of experiment—which alone can deter mine its real value. As it stands, however, Mr. Bourne has generously placed the idea at the disposal of the public through our columns, and we shall be glad to find the matter open up a discussion in our pages, and lead to experimental trials, as well as to practical results. We cannot do better than describe this invention, by means of the annexed copy of a communication which Mr. Bourne sent to the Astronomer Royal, whose opinion upon its merits, we are enabled, by the courtesy of Mr. Bourne, to annex. As suggested by Professor Airy, we commend Mr. Bourne's highly ingenious notion to the consideration of our leading mechanical engineers, who will confer a boon upon our navy and mercantile marine if they can develope the inventor's proposition, and bring it to a practical issue. Mr. Bourne's letter to Professor Airy bears date October 16, 1868, and is as follows:-

"Dear Sir,—On the last voyage I made round the Cape of Good Hope, in the 'Celt,' Captain Baynton, in 1866, the deviation of the steering compass, on one course, was as much as 60deg. I have, last month, had a note from Captain Baynton in which he says 'the maximum deviation of the "Celt's" compasses is 66deg. west, with her head to the westward off the Cape.' Seeing Captain Baynton so often employed in eliminating these errors, whilst working out his course, and reflecting on their danger, especially in the hands of a less careful and skilful commander, it occurred to me that the only way to avoid them was to have a standard compass on board, which should be entirely free from magnetic error, and which, consequently, could not be influenced either by the magnetism of the earth or by local attraction. It would be necessary, therefore, to dispense with the magnetic needle. It occurred to me that the stability of the plane of rotation is the proper principle to work upon, and I have been engaged upon it, at intervals, ever since.

"I beg leave to lay a rough sketch of the result before you, with a request that you will kindly oblige me by saying whether, in your opinion, my theory is correct or not. It is in some measure supported by very imperfect experiments, but it is evident that, to be of any real service, a trial must be made in such a manner as is not likely to be undertaken, unless the theories be confirmed by the most competent authority. Having resided for the greater part of my life in distant lands, I was not aware that the principle had ever been applied to any similar purpose, but have since found that Professor Piazzi Smyth tried it rather successfully on board Mr. Stephenson's yacht, the 'Titania,' in 1856, to obtain stability for instruments for astronomical observations at sea.

"My chiest at first was proper to desire a

"My object at first was merely to devise a 'whirl-wheel compass,' free from magnetic deviation, but, in pursuing the subject, it soon became evident that the instrument, if it answered this purpose at all, might answer other purposes equally well. I think I am right in saying that it can, when accurately constructed, be made to show, by inspection, the latitude of the ship's position,

and sidereal time for the calculation of the longitude. The main desideratum is to obtain an exceedingly rapid, regular, and constant rotation of the heavy planes employed. For this purpose, I propose to use compressed air, operating, by reaction, on the wheels running as much as possible in vacuo. The accompanying sketches will be sufficient to explain to you the mode in which I propose to construct the instrument and some of its details:—

"Fig. 1 represents the apparatus in elevation in one of its positions explained hereafter. a a is a strong airtight chamber (in section) of any convenient size and shape. It might be an open metal framework, glazed with small hexagons of strong plate glass. It should be placed in the engineroom of a steamer, and be provided with a reflecting tube, communicating with a dial plate on deck.  $b^1$   $b^1$  are pipes communicating with a force pump, worked by the engines of the ship, or by a donkey engine, to supply compressed air to the machinery of the instrument.  $b^2$  is a pipe communicating with an air pump, worked in the same way.  $c^{-1}$   $c^{-2}$   $c^{-3}$   $c^{-4}$  and  $c^{-5}$  are hollow gymbal rings, with hollow pivots for the passage of compressed air.  $c^{-1}$   $c^{-2}$  (in section) are horizontal, in the usual manner.  $c^{-3}$  is weighted at bottom, so as to hang in a vertical position.  $c^{-4}$  lis also vertical, being pivoted at top and bottom into  $c^{-3}$  so as to revolve in a horizontal plane.  $c^{-5}$  swings on horizontal pivots, so as to be placed at any angle with the horizon. The main pivot d is a tube passing through the diameter of  $c^{-5}$  at right angles to its pivots. This tube is accurately turned, so as to form the pivot, round which the wheels e e, and the frame f move. It has holes or ports, to admit compressed air into the wheels e e, and the frame f move. It has holes or ports, to admit compressed air into the wheels e e, and the frame f move. It has holes or ports, to admit compressed air into the wheels e e, and the frame f move. It has holes or ports, to admit compressed air into the wheels e e, and the frame f move. Each wheel is hollow, but heavy in its periphery, for the exit of compressed air, so as to produce reaction, and with valvular stuffing boxes, described hereafter.

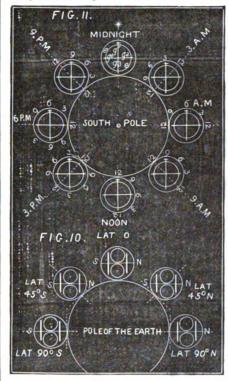
"In figs. 1 and 2, f f is a hollow metal X frame,

"In figs. 1 and 2, ff is a hollow metal X frame, bored through the centre of its four arms, so as to turn on the pivot d; it is provided with airports and stuffing boxes like those of ee.  $g^1g^2g^3$  and  $g^4$  are four heavy wheels or 'gyroscopes,' turning on tubular centres let into the ends of the arms of ff, and are fitted like e. Fig. 2 shows the framework f and the four wheels in plan. Fig. 3 shows one of the wheels in section, where f is a section of one end of an arm of the X frame. The ports in the tubular pivot, and in the axle of the wheel, must be so cut that one or other is always open for the admission of compressed air into the wheel. Figs. 4 and 5 are drawn to a larger scale, and show the tangential orifices in the periphery of each wheel by which to obtain reaction. By turning with a key or turnscrew a small tube fitted into the orifice, a port in the tube is opened or partially closed so as to regulate the emission of air, and, consequently, the speed of the wheel. As soon as the air escapes from the orifice, producing reaction, it is carried off by the air pump, leaving as strong a vacuum as possible.

"Fig. 6 is a portion of fig. 3 on an enlarged scale, and fig. 7 is a portion on a still larger scale to exaggerate the bearing and working surfaces h h; and to show how the compressed air, trying to escape, is checked by the flat steel ring (shown in section at i) running sufficiently loose in a groove turned to receive it, the ring being forced by the pressure of air upon the opposite smooth surface, like the slide valve of a steam engine upon the valve face. The rings or collars k k are forced very tightly into their proper places and secured if necessary. Figs. 8 and 9 show how the hollow gymbal pivots may be made airtight by similar rings, but this is open to improvement.

"The following is the method of using this instrument:—Set the main pivot d d parallel with the axis of the earth by directing it to its proper point near the pole star. Its angle with the horizon will then show the latitude of the place, as seen in fig. 10, where the dotted tangents show the horizon, and S.N. the main pivot (d d, fig. 1). At 90deg. N. and 90deg. S. the instrument will appear in elevation as it does in fig. 1, the main pivot d d being, at the poles of the earth, perfectly vertical. Set the wheels into rapid motion, by admitting highly compressed air into the wheels through the gymbals. Now, on board a ship running down a meridian of longitude, the main pivot d d will, of course, on account of the stability of the planes of rotation of the wheels, retain its true position parallel with the earth's axis, but will appear to the spectator to assume the positions, as seen from the centre of the circle repre-

senting the earth in fig. 10. If the gymbal ring  $c^3$  be provided with a glass globe accurately divided, or with a sphere of graduated rings, the latitude will be read off, by inspection of the degree to which the pivot points. Then, if the main pivot d d be parallel with the axis of the



earth, the main wheels  $e^{-1}e^{-2}$  are revolving parallel with the plane of the earth's rotation, and the wheels  $g^{-1}g^{-2}g^{-3}g^{-4}$  are revolving at right angles to the plane of the earth's rotation. Thus, on the same principle of their stability, any point of their frame, as  $\dagger$ , fig. 2, will, of course, if directed to a fixed star one day, maintain the same direction, and appear to revolve on its axis d d in twenty-four hours sidereal time, as shown in fig. 1:

"I have not entered thus fully into the description of the action of the instrument for your information, as you know, better than I do, what it ought to be, and to do. But, as I find that the principle is little understood, even by men of high standing as mechanics, I may perhaps be excused in seeking to obtain confirmation of my theories, before asking any one to spend time and money in trying to carry them into practice. I am fully aware that very great accuracy of workmanship will be needed; and the whole of the instrument contained within the ring  $c^3$  must be in perfect equilibrium. But, if the whole be made of steel, for durability of working parts, and homogeneity of substance, and of sufficient size (say, with wheels from 1ft. to 3ft. in diameter), and if the parts be shaped by machinery accurately constructed for the purpose, and with minute gauges, I do not think that difficulty is insurmountable. The principle being admitted, the end will be attained. I think, by injecting the lubricating material with the compressed air.

"The speed of the wheels must be so regulated, that the speed of any one wheel may not be so excessive as to cause it to overpower the stability of all the others, so as to produce the precessional motion seen in the gyroscope. But I think this difficulty will be overcome in an instrument of sufficient size and power. And the power may be increased to any required extent by the increase of size or speed in the pumps. By the use of compressed air, the power and speed will be most easily regulated. It is this application of the constant power to wheels placed in such a position, with means of regulating the speed, for which only I claim any credit. The principle, and its application in other forms, is well known to you.

"Two or more of these instruments in the engineroom of an iron steamer, and under the charge of
the engineers, would form standard compasses of
great value, by which to check the magnetic needles
of the steering compasses, and as a check upon one
another, and to be checked frequently by azimuths
and observations. Without gymbals, and as an
instrument fixed to the latitude of the place, would
not the frame f f and its wheels g g form a useful

star-time measure or astral chronometer for an observatory? If made of sufficient size, with great accuracy, as to fitting and equilibrium, with long bearings and antifrictional rollers, which may be easily arranged, it seems to me—accustomed as I am to the construction of locomotive engine and other machinery and instruments—that there would be no insuperable difficulty opposed to it. Even if the instrument cannot at first be constructed with such accuracy as to be absolutely correct; yet, if its error be constant and regular, so as to be readily allowed for, like that of a chronometer, and not arising from local causes, the same end, it seems to me, will be attained.

The flow of water would not be sufficiently rapid to produce the required speed of rotation; but steam might be used instead of compressed air. This and electro-magnetic or magneto-electric engines have been considered by me. But the compression of the air may be so exactly regulated, and it—air—is so simple in its application, that, for this purpose, it cannot be equalled.

this purpose, it cannot be equalled.

"I have the honour to be, Sir,

"Your most obedient servant,

"John Fred. Bourne, M. Inst. C.E."

"Royal Observatory, Greenwich, "London, S.E., November 13, 1868.

"Dear Sir,—It is but lately that I have found time to examine the papers which you sent me under date of October 16. I am very much struck with the ingenuity and the obvious efficiency of the method by which you propose and to maintain the rotation of your heavy dises. The principle of making the rotating plane, in fact, produce its own maintaining power, by the intromission of strong gas through the axis, and its discharge at the circumference, is very happy. I think that if this had been superadded to Professor Piazzi Smyth's other contrivances, it would almost have induced me to recommend a trial of his principle in some of our large mail steamers (the only class of vessels in which I thought it likely to be introduced), for the purpose proposed by him, namely, the support of telescopes, &c. I suppose that the enlargement of the pivots for the passage of gas might not necessarily be so great as to produce unmanageable friction.

"But you aim at a much higher object, that of maintaining a plane in a position parallel to itself (as in space) for whole months. I really cannot give any reason, theoretical or experimental, against the success of this. I do not see, in the mode of action of the various parts, anything which tends to change the position of either rotating disc in a definable direction as the vessel pitches or rolls or changes her longitude or latitude. Yet I feel a strong assurance that it never could preserve its position with the accuracy which is required. The wear must be considerable, and wear infallibly introduces irregularity. A ship makes perhaps 3deg, in a day. Can you hope that this instrument will preserve its position for a day within 3deg.? I think not, but I cannot tell why.

think not, but I cannot tell why.

"If I were a wealthy engineer, I would certainly try the construction in a home experiment. Your proposed method of maintaining the rotation appears completely to remove what had always seemed to me the insuperable difficulty in giving fair play to the principle of the rotating disc. Can you not make an impression on some of our great mechanists, to whom the expense would be insignificant?

"I have treated this all along as a purely mechanical arrangement. For the want which suggested it to you, namely, that of correct magnetical compasses, there really is no need of any special contrivance. A captain who understands the principles of compass-correction, can at any time, with only two bearings of his ship, so adjust his magnets that no sensible error will remain.

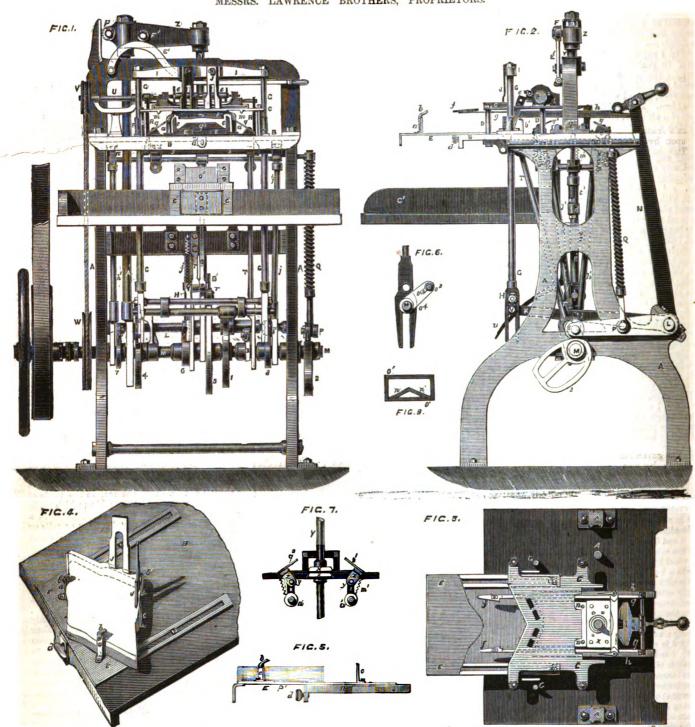
"I return the packet of papers to the address which you have given me, namely, to the care of Messrs. Budden, Jennings, and Co., 48, Fenchurch-street.

"I am, dear Sir,
"Your faithful servant,
"(Signed) G. B. Airy.
"J. F. Bourne, Esq."

An American paper states that in consequence of the demand for hair of peculiar colours and shades a new branch of "kleptic industry" has sprung up in New York. It appears that the hair thief abounds in the horse cars of the city, where the excuse of putting his elbow on the window enables him to operate with greater ease; but he is also to be found in every place of public gathering, the church included. The tresses dangling behind the head are his easy prey.

# SELF-FEEDING ENVELOPE FOLDING MACHINE.

MESSRS. LAWRENCE BROTHERS, PROPRIETORS.



# SELF-FEEDING ENVELOPE FOLDING MACHINE.

WE would direct our readers' attention to a very complete machine, by which the feeding, gumming, stamping, creasing, folding, delivery, and collection of envelopes are performed with the aid of only one attendant, who has ample time to band the envelopes so produced. The credit of inventing this machine is due to Mr. G. H. Reay, of New York, by whom it was patented in the United States, England, and on the Continent. The patents for Europe are, however, the property of Messrs. Lawrence Brothers, of 22, Basinghall-street, who are supplying them to manufacturing stationers. The machines are manufactured in England for the proprietors by Mr. John Gough, of 42, Kirby-street, Hatton-garden, at whose works we recently examined one of these compact and ingenious machines.

To thoroughly appreciate the advantages these machines present, our readers must bear in mind that other machines require three attendants to

perform the operations carried out by these, which require one attendant only. There is the attendant to feed with one blank at a time; and as ordinary machines deliver the envelopes simply creased, another attendant must place the flaps of the envelopes in proper order and gather them up, whilst a third attendant is required to band them. In the machine we are about to describe, the attendant sits down in front and places in the proper receptacle a certain number of blanks, regulated according to their substance; the apparatus picks up the blanks singly and conveys them to the creasing box, and, during their progress, they are stamped, if so required. After having been creased, the envelopes are, by a double action of the plungers, most securely and correctly fastened and folded. After leaving the plungers, they are mechanically collected and delivered to the attendant in symmetrical order ready to be banded. Thus, from the time the blanks are delivered to the machine till the perfect envelope is turned out, the attendant has nothing to do with them, which leaves ample time to band them up.

This machine is represented in front elevation at fig. 1 of our engraving, whilst fig. 2 shows the apparatus in side elevation. Fig. 3 is a plan, with the upper framing removed, to show more clearly the apparatus for feeding and pressing. A is the main frame of the machine; it carries near its upper part a table B, above which is a plate C supported by columns or pillars D on the table B. The plate C is perforated for the passage of the lifters. The table B also carries near the front end another plate E, free to be moved in and out as required. This plate and a portion of the table B are shown on a larger scale in isometrical view in fig. 4, and inside view in fig. 5. The envelope blanks are placed on the plate E when drawn out (as shown in figs. 2, 3, and 5), and are kept in place by projections a on the plate. The projections are fitted at top with bent springs b b for a purpose to which we shall presently refer. When the plate E has been supplied with a number of blanks, it is pushed in, as shown in fig. 4, until the blanks come against projections c c on the table B, when they are in position for being fed

singly into the machine. The plate is then secured

by means of a thumb screw d.

The table B carries guides F for vertical rods
G G which pass through it. These rods are forked at bottom to embrace a horizontal rod H, while at top they are connected by a cross beam I from which lifters J J depend. These lifters perform which lifters J J depend. These lifters perform the double purpose of gumming the envelope blanks and of lifting them one by one from the supply plate E. The lifters are forked at bottom, and the forked ends are supplied with gum from the rollers e e, which have a to-and-fro motion imparted to them. Immediately after being gummed, the lifters J J fall, come in contact with and take up the uppermost blank, which adheres to their gummed surface. The lifters J J receive up-and-down motion from a rocking lever K centred up-and-down motion from a rocking lever K centred on a shaft L at back of the machine, and acted upon by a cam I on the main driving shaft M. This cam is double, that is, it is formed so as to produce a double action; it first raises the lifters J J a certain height (after their forked ends have been gummed and have taken up a blank) in order that the blank may be released by coming in contact with the under surface of the plate C. The bent springs b b on the projections a a of the supply plate E at the same time bend down or curve the end flaps of the blank to ensure its being caught by fingers. The second portion of the cam 1 then acts to raise the lifters J J still higher when the gumming rollers e e come under their when the gumming rollers e e come under their forked ends to supply them with gum for another blank. In the meantime, the first blank has been seized by fingers f f on the ends of slide rods g g, which are moved to and fro in a framing h fixed on the back part of the table B. This movement is effected by a weighted rod N, which connects a cross bar O of the slide rods g g to the back shaft L. The weight on the rod N prevents all jar and shock in this part of the machine. The shaft L receives motion from a lever P on its end, acted receives motion from a lever P on its end, acted upon by a cam 2 on the main shaft M. The lever P is furnished with a spring rod Q to keep a roller i carried by the lever on the face of the cam. The fingers ff are undercut at the back, as seen in fig. 2, in order that in their backward motion the undercut portions may come against the blank and carry it to the creasing apparatus.

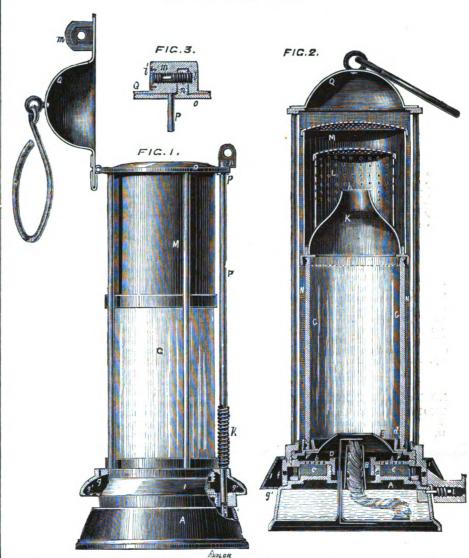
The gumming rollers e e receive their to-and-fro motion by means of levers R R connected to a cross bar S under the table B; the cross bar S in its turn receives motion from a nearly vertical rod the lower end of which is forked and furnished with a roller j, which rides upon and is acted on by a cam, 3 on the main shaft M. The gumming rollers e e are fitted in a frame which moves to-andfro in guides on the plate C; any gum which may fall from the rollers is caught upon this frame. The rollers are composed of printer's composition covered with india-rubber. They receive their supply of gum from another roller or doctor k, which rotates partly in a box l containing the gum. Which rotates partly in a box t containing the gum. The doctor k is made to rotate by a projection on its axis being acted on by a pin on the shaft U carried by a framing on the table B. This shaft receives motion through a pulley V over which a band passes to another pulley W on the main shaft M. The gum box l is provided with a scraper or expected to regulate the supply of Vspreader to regulate the supply of gum.

The plate C has two ribs m m formed on its under side, which, as the envelope blank is being carried back by the fingers ff, as before explained, keep the end flaps slightly curved downwards, in order that the blank may be presented in that position to the plunger. Beneath the plate C is an inclined plate n which supports the body of the blank while being carried to the creasing box. Immediately the blank is brought over the creasing box. ing box, a top plunger X comes down upon it and drives it into the creasing box, whereby the four flaps are creased or brought into a vertical position; the plunger X then ascends. Up and down motion is imparted to this plunger through a vertical rod Y connected to a horizontal beam Z above the machine. The beam Z is again connected to another vertical rod A <sup>1</sup> forked at its lower end, and carrying a roller o which rides on a cam 4 on the main shaft M, except after the plunger X in its down stroke has reached the envelope blank. If the pressure of the plunger is not sufficient, greater pressure is caused to be exerted by another roller o<sup>2</sup> which rides over the roller o at every revolution of the main shaft. This additional roller or is carried on a pin adjustable in a slot or (see the detached view, fig. 6), in an arm or crank or 4 on the main shaft. The beam Z is guided in its motion by a roller which bears against a projection on the upper part of the main frame A.

When the top plunger X ascends, two fingers q q

#### SAFETY MINERS' LAMP.

BY MR. STORY HORN.



come down upon and fold the end flaps of the blank; then another finger q 1 comes down upon and folds the back flap, the inner surface of which has been gummed; a fourth finger  $q^2$  then comes down upon and folds the front flap. Simultadown upon and roles the front hap. Simultaneously with the coming down of the two end fingers q, a bottom plunger  $X^1$  is made to ascend to the bottom of the creasing box to support the blank. Immediately after the folding of the flaps by the four fingers, the top plunger X again descends and carries another blank into the creasing box. The fingers then retire by means of mechanism we shall presently describe just before the plunger X in its down stroke would press upon them, and this plunger exerts pressure upon the edges, and still printinger exerts pressure upon the edges, and still greater pressure upon the gummed portion (owing to the peculiar construction of the face of the plunger) of the envelope, the folding of which has just been completed. The finished envelope and the creased blank are now momentarily held between the two plungers X X 1.

It will thus he seen that each blank remains in

the creased blank are now momentarily held between the two plungers X X \(^1\). It will thus be seen that each blank remains in the creasing box during two descents of the top plunger X. The bottom plunger X \(^1\) is made to rise and fall, by means of a cam 5 on the main shaft M, against which a roller \(^r\) on a forked vertical rod B \(^1\), which carries the plunger X \(^1\) bears. The finished envelope is caused to fall from the top of the plunger X \(^1\) by means of two projections, which in the down stroke of this plunger pass through slots, and tilt the back of the envelope, which falls edgewise down a shoot D \(^1\) into a box C \(^1\). The back of this box is free to slide in and out, and is connected to a lever s centred on a support t fixed to the main frame A; the pin which connects the lever s to the support t also connects to the same support a curved lever u. A bar v, which supports the vertical rods G G, presses in its downward motion upon rods G G, presses in its downward motion upon the curved portion of the lever u, and through the lever s causes the back of the box C  $^1$  to carry

forward into the box the envelope last delivered from the creasing box. The box  $C^{-1}$  extends to the front of the machine, and forms a table, which may be used by the attendant while banding the envelopes into packets as they are taken out of

The two fingers q q, for folding the end flaps of the envelope, as before explained, are arranged as shown in fig. 7, and act as follows:—They each consist of a plate with bevilled edges secured at back to a block x, and are furnished with adjusting back to a block x, and are furnished with adjusting screws. Each block x works upon a pivot y in an arm z, carrying a boss a formed with teeth on a portion of its periphery; the teeth on each boss are geared into by a rack or toothed boss on the upper part of a vertical rod  $c^1$ . The two vertical rods  $c^1$  are connected by a horizontal bar d 1 caused to rise and fall by another vertical bar  $a^{-1}$  caused to rise and fail by another vertical rod  $f^{-1}$ , the lower end of which is forked and furnished with a roller  $g^{-1}$  which rides over a cam 6 on the main shaft. In the down stroke of the forked vertical rod  $f^{-1}$  the racks on the rods  $c^{-1}$ , by gearing into the toothed bosses  $a^{-1}$ , causes the by gearing into the toothed bosses  $a^1$ , causes the fingers q q to turn upon their pivots y, and take up a position over the creasing box and under the top plunger, and so fold the flaps. In the up stroke of the rod  $f^1$  the fingers q q are caused to retire, and as soon as they are free from the plunger X a spring  $m^1$ , connected to the back of each finger block x, draws down the back of the block, and thereby raises the fore end of the finger.

The fingers  $q^1 q^2$  for folding the back and front flaps of the envelope are arranged and act similarly to the fingers  $q^q$ , for folding the end flaps, as just explained. The finger  $q^{-1}$  is acted on by a nearly vertical rod  $h^1$  toothed at its upper part and forked at bottom, where it carries a roller  $i^1$ , which rides even a roll of the financial of the folding that  $i^1$ . The which rides over a cam 7 on the main shaft. The finger  $q^2$  is similarly acted on by a rod  $j^1$ , roller  $l^1$ , and cam 8. In order that the top plunger X,

the second time it acts on each blank, may, after the fingers retire, exert greater pressure on the gummed portion of the envelope, ribs or projections n are formed on the face of the plunger, shown in fig. 8, which is a view of the face of the plunger to correspond with the gummed portion in addition to the ordinary rib or projection o 1 on the edges of the face of the plunger. As there are three thicknesses of paper at the gummed portion of the envelope, this portion consequently receives the greatest pressure. The plunger X is perforated for the escape of air. To prevent the envelope blanks adhering to each other, a portion of the supply plate A is removed, as seen at  $p^1$ , fig. 5, so that the lifters J J, in coming down upon the blanks, may press down and separate their edges.

The forked vertical rods referred to as being fitted with a roller riding on a cam on the main shaft are each furnished with a spring to keep the roller down upon the face of its cam. To raise the top plunger X and its beam Z when necessary for cleaning or repairing the machine a curved lever E is fitted on the main frame A. By turning the lever on its pivot it comes against a roller F 1 on the beam Z, and raises the beam until the roller falls into a slot formed for the purpose in the lever E 1.

The important economy of these machines is illustrated by the fact that over 200 of them are at present in operation in the United States, where they were originally brought out, and many others in England, France, and Germany. Two have recently been shipped to Egypt. Messrs. Waterrecently been supped to Egypt. Messrs. Water-low alone employ six of these machines, which give overy satisfaction. The mechanical arrange-ments are most perfect, and we believe this excellent apparatus only requires to be known to be generally used for envelope making by our leading manufacturing stationers.

### HORN'S SAFETY MINERS' LAMP.

LTHOUGH the Davy lamp, by its long use has become a recognized "institution" with miners, its acceptance and adoption are not to be taken as certificates of its perfect safety. It is not absolutely safe, but it has passed through the hands of several inventors who have tried to make it so. One of these, Mr. Story Horn, of 23, Grove-street, Newcastle-on-Tyne, has at last succeeded in perfecting it. So thoroughly has he done this that the entrance of the explosive gas within the lamp actually extinguishes it, as demonstrated to nary "Davy," an explosion is almost inevitable in a foul mine, if the lamp be moved suddenly or exposed to a strong draft. Its light also is feeble, by reason of the choking of the wire gauze with soot, whilst in Mr. Horn's lamp there is no such liability to choke, whilst the flame is bright and steady, brighter indeed when the lamp is closed than when it is open. Mr. Horn's lamp is—so to speak—a small furnace; the air entering below the fire, passing into an air chamber, and rising thence through holes pierced in a horizontal plate, to feed the flame. The products of combusplate, to feed the flame. The products of combus-tion escape through a narrow chimnoy and two perforated caps, which prevent down draught. If explosive gas enters with the air it has to pass through the holes in the horizontal plate, and as these are not close together, the gas burns as a feeble jet at each hole, instead of forming a body of flame, as it would if passed through the con-tiguous meshes of wire gauze. The accumulated smoke, resulting from the combustion of gas within the lamp, soon extinguishes both the jets, and the lamp itself, without explosion, as we have ourselves seen done with this lamp. This result ourselves seen done with this lamp. This result would simply leave the miner to grope his way to a place of safety from a point in the workings, where, with the ordinary "Davy," he and his comrades might have been blown to eternity without a warning.

The construction of Mr. Horn's safety lamp will be seen from the accompanying engravings, in which fig. 1 represents a side elevation and partial section of one form, whilst fig. 2 is a vertical section of a larger sized lamp, slightly varied from fig. 1. Fig. 3 is a sectional detail of the locking arrangement shown in fig. 1. In these figures, A is the oil reservoir and base of the lamp, provided with a tube B in the centre, for the reception of the wick or cotton, as shown in fig. 2, and for replenishing the reservoir with oil. C is the air chamber, screwed at a to the top of the oil reservoir. The top plate b of the air chamber is finely perforated, and its circumference is com- am enabled to bear my testimony to the value of posed of wire gauze c. D is the combustion your invention. The repeated experiments I made

chamber surrounding the wick, the top being formed by the removable metal dome E, central aperture for the passage of the wick. Α bayonet joint serves to connect the dome E with flange F, which has an annular dovetail groove d on its upper surface, for the reception of the lower edge of the glass chimney G, which is permanently cemented in it. A bead round the top and bottom of the glass chimney, in order to form a more secure hold for the cement. The flange F is screwed into the outer ring H, which forms the upper portion of the base of the lamp. This ring H is perforated circumferentially, as shown at ff (fig. 2), in order to admit air horizontally into the air chamber C.

With a view to protect the air chamber from any sudden gust, "blow," or outburst of gas or air, an outer perforated guard I of an annular form is applied round the perforations f f. This guard may either be made solid with the ring II, as shown in fig. 1, where a series of per-erations  $g g^{-1}$ , are shown both at the top and bottom, the perforations f being dispensed with, or it may be a separate loose attachment with perforations  $g^{-1}$  at the bottom only, as shown in fig. 2, n which latter case it is fixed in position by screws. The products of combustion pass up the glass chimney G, through the contracted aperture h in the metal cone K, which is fitted on to the top of the chimney. This cone is enclosed in a double cap of copper, the inner one L being perforated at the sides and top, whilst the outer one M is only perforated at the top. The cone and caps can be readily removed for the purposes of cleaning or repairs. The glass chimney is sometimes or repairs. The glass chimney is sometimes surrounded with a cylindrical wire gauze cage N, as shown in fig. 2, as a protection against breakage, but, if not found requisite, this protection may be dispensed with, as shown in fig. 1. When using the wire gauze, it is secured in place by nipping its lower edge between the ring or flange F and the part H, as shown in fig. 2, the various joints in the lamp being sufficiently tight to exclude all air excepting that which passes through the air chamber C, so that should the gauze N be taken out the lamp

will remain as safe as before. Mr. Horn's improved mode of locking the lamp is shown in fig. 1, and consists of two lamp is shown in fig. 1, and consists of two holes, which are respectively drilled in the top rim O and bottom flange, the last-mentioned hole being continued, as shown at i, into the metal of the base A of the lamp. P is a sliding steel rod, held upwards, when left free, by a belical spring k, the rod, when forced down, the rod is the reserved to the rod of the rod. entering like a bolt into the recess or spring i and thereby effectually preventing the base from being unscrewed. This rod is held down by the being thecrewed. This rod is not down by the hinged cover Q of the lamp (shown turned back in fig. 1), which presses upon the top of the rod P when closed, and keeps it in its locked position. The cover is locked when shut down in the by means of a concealed screw l (shown in the sentional detail for 3) having an oyal-shaped sectional detail, fig. 3) having an oval-shaped head which fits a correspondingly shaped key. This screw is contained within a piece of metal m fast on the cover, the piece of metal having a slit or opening formed in it for the entrance of a metal tongue n on the rim O. hole is made transversely through the tongue n, and when the parts are in their closed positions the screw l is turned by a key, so as to cause it to pass through the hole in the tongue, thus locking the cover down and maintaining the lower end of the rod P in the aperture in the base of the lamp. A small plate l 1 serves to prevent the entire withdrawal of the screw from the lamp, but so soon as the end of the screw is withdrawn from the tongue the spring k forces upwards the rod P, and leaves the base A free to be unscrewed or detached. A small pin p in the rod P prevents it from rising too high. The lock is placed at the base when a gauze protector is used, as shown in fig. 2, the concealed screw l having an oval-shaped head entering direct into a hole or recess in the side of the base. In this arrangement of lock the top or cover Q will be permanently fixed to the rim. It will thus be seen that Mr. Horn has succeeded in producing a lamp which is really entitled to the prefix of "safety." The value of this invention cannot be over estimated.

An important fact in connection with this lamp is that it has successfully stood the test at Hotton Colliery, where it has been tried with the lamp-Conterly, where it has been tried with the testing apparatus fitted up there. Mr. Wm. Chandler Roberts, F.C.S., F.G.S., &c., has given Mr. Horn the following certificate under date of the 5th instant:—"It is with much pleasure that I am enabled to bear my testimony to the value of with your lamp were perfectly successful, the flame being invariably extinguished when the lamp was introduced into explosive mixtures of coal gas and air."

ON THE METHODS EMPLOYED IN DE-TERMINING THE COMMERCIAL VALUE AND THE PURITY OF COAL GAS.

BY MR. F. W. HARTLEY.

T the last meeting of the Society of Engineers, held April 5, 1869, Mr. F. W. Bryant, prosident, in the chair, a highly practical paper was read on the above subject by Mr. Hartley, and of which the following is a full abstract:— The author commenced by observing that in most transactions a purchaser could, to a considerable extent, secure his own interests by the exercise judgment and discretion, but that in the case of gas it was impossible, by ordinary observation, to determine if it were of the quality it should be. Legislative enactments had, therefore, been made to protect the consumers. The gas compa-nies in each of the large towns, and in most of the smaller places, were bound to maintain their gas at a certain illuminating power and degree of purity, as certified by a public officer, who was to be provided with testing apparatus, and upon whose evidence the gas company concerned was, in the event of non-compliance with the conditions established, to be liable to penalties, recoverable before a magistrate. These enactments had been really effective in protecting the consumer, but, unfortunately, no precise instructions have laid down until a recent date as to the conditions to be observed in testing. The amplest specification was that the gas should be burned from a 15-hole argand with a 7-inch chimney at the rate of five cubic feet per hour; should not discolour a or ne cubic feet per nour; should not discolour a current of gas; and should not contain more than 20 grains of sulphur in any form per 100 cubic feet. In 1860, it was also enacted that Cannel gas should be burned when tested for illuminating power from a batwing or fishtail burner, the feet per hour consumption being still adhered to.

Burners nominally of the same size and description produce for a given consumption vastly different effects. No definite standard being fixed, discrepancies and disputes as to the quality of the gas were inevitable. No particular photometer was ever specified, but this omission has led to no evil, ewing to Bunsen's being generally employed. No method was detailed for determining the quantity of sulphur, of which the gas was not to contain more than 20 grains per 100 cubic feet. Efforts have been made to secure uniformity in the apparemains to be done. The conditions imposed as to freedom from ammonia and sulphur were very stringent, and were agreed to in the absence of sufficient knowledge. An Act regulating the supply for the City of London was passed last year, which authorized the Board of Trade to year, which authorized the positive appoint three gas referees, whose business it is to define from time to time the standard of purity determine the methods by which it define from time to time the standard of purity for gas, determine the methods by which it should be tested, and issue precise instructions for the guidance of the actual operators, who are called gas examiners. The referees appointed are J. S. Peirce, Esq., F. J. Evans, Esq., and R. H. Patterson, Esq. Their first instructions were issued in January last, and are hereinafter referred to.

The commercial value and purity of coal gas depends :-

 On its illuminating power.
 On its freedom, to a certain extent, from ammonia.

3. On its freedom from sulphuretted hydrogen.
4. On its freedom, to a certain extent, from sulphur in any form other than sulphuretted

hydrogen.

Illuminating Power.—It appears from documentary evidence that in the very early days of gas lighting the construction of burners was well considered, and the conditions necessary for the production of the best effect thoroughly under-stood, but in spite of the reiterated teachings of competent men, burners of erroneous construction have during many years been produced in great numbers. Forty-three years ago, Christison and Turner published a statement of their experi-ments, the conclusions deducible from which the author of this paper has summarized as follows:-

1 That up to a certain maximum consumption for each burner, the light increases in a much greater ratio than the consumption of gas. 2. That for each burner there is a certain size

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of flame which is most economical-a corollary of the first proposition.

3. That in argand burners the size of the holes and their distance from each other is of the utmost importance. The holes should be so near to each other that the flame unites at its base. For gas sp. gr. 550 to 650, the holes should be 1-32nd inch diameter and about 12-100ths of an inch apart. For gas of a higher gravity, the holes should be 1-50th inch diameter.

4. That the size of the central aperture of an argand exercises an important influence on the amount of light yielded.

5. That the greatest amount of light is obtained when the flame becomes tinged with yellow and is

near to the point of smoking.

6. That the glass chimney should be propor tioned to the size of the burner and the consumption desired.

7. That consumers, generally, cannot burn the gas in such manner as to produce the best effect on account of the liability of the flames to smoke.

These propositions really comprise all that is known respecting the principles which should govern the construction of gas burners. The sixth proposition is impracticable of application. Narrow chimneys are apt to become partly fused and opaque, they are liable to frequent breakage, and flames enclosed in narrow chimneys are apt to smoke on the least disturbance.

Among the teachers on the subject of gas burners may be mentioned Clegg, Peckstone, Alex. Wright, Lewis Thompson, Dr. Letheby, and Henry Bannister. Alex. Wright stated that of burners equally suited for the gas, and consuming it at the same rate, the most advantageous is the argand, next the batwing, and then the fishtail. That the larger the quantity of gas properly consumed in a given time from a burner, the greater is the light given per cubic foot. That the best results arise with a well formed but flagging flame and the worst with an irregular, wire-drawn flame. Lewis Thompson said in 1851, every burner has (1st) a certain fixed amount of gas which it will consume to advantage; and (2nd) gives its maxi-mum effect where the flame is on the point of That the quantity of light is greatest with the argand and the intensity with the fishtail. Poor or common coal gas should issue more gently than rich or Cannel coal gas, and from burners with larger holes than those for the latter

The yellow-tinged flame, the flagging flame, and the gentle current, all mean the same thing, viz., low pressure; and MM. Dumas, Regnault, Andouin, and Berard, have established as a general law "that the greatest illuminating power is obtained with low pressures, and the maximum light with pressures equal to 079 to 12 of an inch head of water." They further state that batwing burners of the same diameter, burning the same quantity of gas, yield more light when the slits are wide—1-36th of an inch gave them the best results. The diameter of the burner should be proportioned to the desired rate of consumption but is less important than the width of slit. That single jot burners are very disadvantageous. That a fishtail is not much superior to two single jets, with holes of the same diameter, if the holes be very small. That the fishtail is generally inferior to the batwing. That argand burners, of almost the same appearance, may require to burn double the quantity of gas to give the same quantity of light, which is dependant upon, 1st, the width of the jet holes or slit; 2nd, on the number of holes; 3rd, on the actual and relative dimensions of the apertures by which air gains access to the interior and exterior parts of the flame; 4th, on the height of the chimney.

The first three conclusions accord with Christison and Turner. As to the fourth, an increase in the height increases the consumption for the same light. An 8-inch chimney as against a 10-inch one was 5 to 7 per cent, more advantageous. The foregoing conclusions relate to common gas; Cannel gas, as before stated, requires somewhat higher pressures. The investigations of Dumas and associates were so exhaustive, and they expressed their conclusions so definitely, that they are frequently credited with having established principles which they only, in fact, confirmed.

Down to the year 1860 each operator was at liberty to choose the burner he fancied best; and so difference existed in the burners employed, that the light evolved by five feet of gas of the same quality may have differed to the extent of 20 per cent. with different operators. In the above year Mr. Geo. Lowe presented to a Committee of the House of Lords an argand burner with a steatite top, which was accepted as a standard burner. No

description of this burner was given in the Act of A similar burner (No. 1 in the table below), made by Mr. Sugg, was exhibited. The table was reby Mr. Sugg, was exhibited. The table was re-ferred to as illustration of the difference in the light evolved by 12-candle gas burning at the rate of five feet per hour. No. 1 had a steatite and the rest iron tops.

#### ARGAND BURNERS.

	No. 1.	No. 2.	No. 3.	No. 4.
Size of jet holes	.06ln.	•05in.	-055in.	•03in.
External diameter	1.1 ,,		1.08 ,,	
Diameter centre aperture	45 ,	49 ,,	.52 ,,	-54
Pressure below burner	045	-050 ,,	05 ,	-18 ,
Proportionate light	100 ,,	94 ,,	80.5 ,,	74.3 ,,

In respect to flat flame burners for Cannel gas, the Act of 1860 is also not specific. diameter, the width of slit or of the jet holes, and the pressure at which they were to burn the gas, should have been stated, and also whether the side or edge of the flame was to be presented to the photometer. In practice, the side is presented. A point of light would emit an equal number of rays in all directions, but flat flames emit rather more from the side than from the edge, owing, no doubt, to part of the flame being further from the object illuminated, and the want of perfect tran-sparency in artificial lights. Any of the batwings specified in the table might be used as complying with the Act of 1860, when testing Cannel gas, although they afford very different results.

## BATWING BURNERS.

Number of the burner	12	9	8	7
Diameter ,, ,, ,,	·344in.	·324in.	·31in.	·304in.
Width of the slit	·017 .,	-017	·013	·313
Depth ,, ,,	•23	·18	·16	·14 ,,
Depth ,, ,, ,,	25	·8 .;		·675 "
Proportionate light per }	100	98-4		77-5
5ft, of 20-candle gas				

The sperm candle is a very defective standard. It is difficult, if not impossible, to obtain candles of uniform quality both in respect to the sperm and It is rarely that a candle burns at so low the wick. a rate as 120 grains per hour, and hence a standard light is rarely obtained. It is usual, however, to reject candles which diverge more than about ten per cent. from the standard rate, for there are good reasons for believing that, under favourable conditions, the variation in the light given, as with gas, is greater proportionately than the variation in the rate of consumption. No reliable data has been established on this point. In France, the standard light is produced by the combustion of colza oil at the nominal rate of 42 grammes per hour, in a carcel lamp, under specified conditions. The author has made hundreds of experiments with the carcel lamp and colza oil, and, in his opinion, it forms a worse standard even than the candle.

Various schemes have been proposed for the production of a standard light, the most promising of which is due to Mr. Keats, who proposes to use a modified and specially constructed moderator lamp, under special conditions, burning sperm oil at the rate of about 750 grains per hour. He secures a very close approximation to regularity of consumption and of light, the value of which is equal to ten sperm candles. Details are published in the "Journal of Gas Lighting," of March 16, 1869. The lamp and balance for use with the same were exhibited in connection with a pho-

A photometer is an instrument which is based upon-first, the power which the eyes possess of judging of the equal illumination of different parts of the same object; and, second, on the laws which govern the diffusion of light. There are various kinds of photometers, but only two are now much used, viz., Foucault's and Bunsen's. The first is used in France (description given), the latter in England. With both photometers, the object to be illuminated is a semi-transparent screen. Bunsen's screen consists of a piece of white paper, 3½in. to 4in. diameter, impregnated with wax or sperm, with the exception of a spot in the centre. Such a screen is of unequal transin the centre. Such a screen is of unequal trans-lucency, and when its sides are unequally illu-minated, the centre spot will, on the side least illuminated, appear comparatively dark and opaque; but when both sides are equally illuminated, the centre spot will be almost invisible.

If a light be put successively in the centres of globes of 2ft., 4ft., and 6ft. diameter respectively, it will, in such case, illuminate the whole interior surface; but inasmuch as the superficies of globes are to each other as the squares of their radii, it follows that while the quantity of light thrown upon a given area, say, one square inch, would, with the 2ft. globe, be equal to one, it would, with the 4ft. globe, be equal to only 25, and, with the 6ft. globe, to 111 only. This is expressed

by the law, that lights which equally illuminate an object are to each other as the squares of their respective distances from the object. The screen, when placed between two lights, and equally illuminated, may be conceived to form part of the boundary of two globes, in the centre of each of which respectively one of the lights is situated.

The Bunsen photometer is made in various forms, and ranges in length from 50in. to 100in. between the lights. That exhibited is Dr. Letheby's form, and is, in the author's opinion, the best photometer extant. It, like most other Bunsen photometers, consists of a wood rod, about 4in. broad, set on edge. The rod is graduated into squares of distances, which represent the value of the stronger light in multiples and decimal parts of the value of the weather light. A saddle or slide fits upon and carries the screen at right angles to the rod. The peculiarities of this photometer are, that the screen is enclosed in a small box, which is open at the ends and in front, and which is provided with two reflectors, set at an and which is provided with two relieveds, set at an angle, so as to reflect the images of the two sides of the screen to the eyes. The lights are partly enclosed by blackened, upright, wood screens, which prevent to a great extent the diffusion of light into the operating room, cut off from the operator's eyes all rays, save those reflected from the screen, and when certain additional pre-cautions are taken, obviate the necessity for blackening the ceiling and walls of the apartment, which is necessary with many photometers. Besides the photometer, it is necessary to employ a balance to weigh the candle or candles, an accurate meter to measure the gas, a delicate governor to maintain regularity in the gas supply, a cock with micrometer for making minute adjustments in the gas supply, and, lastly, a well made clock, to measure time.

The balance is usually separate from the photometer, and the candles have to be removed, in order to be weighed. The author has combined the balance with the photometer, so that the candles may be weighed in situ. This is a great improvement, as it adds to convenience and accuracy. Mr. Keats, some time since, adopted a similar practice, but his arrangement differed from the author's. The meter is furnished with an index, which shows the hourly rate of consumption in one minute. The governor is a delicate automatic instrument, capable of maintaining a constant pressure of gas on its outlet, although the pressure on its inlet may be greatly increased. The micrometer cock is interposed between the governor and the burner. The minute clock indicates seconds, and, in some cases, strikes as well as indicates minutes.

The proceedings in an experiment are as fol-Several sperm candles are cut into halves, and the wicks of the lower halves exposed by cut-ting away a portion of the sperm. The wicks are The wicks are ting away a portion of the sperm. The wicks are all lighted, and the candles allowed to burn in a place free from draughts, until a well-formed wick is, in each case, attained. The candles are then all carefully extinguished, by touching the top of the wicks with a piece of sperm and immediately blowing out the flame. The candles are then ready for use. Those which burn irregularly, or appear of inferior quality, are rejected.

The gas is turned on to the burner and lighted,

and the consumption adjusted by means of the governor and micrometer cock to five cubic feet per hour, time being taken by the minute clock. The candles are next lighted with special precautions. To preserve the wick well formed, they are nearly counterpoised in the balance, and when the candles have consumed so much sperm as to become lighter in weight than the counterpoise, and the balance just turns, the time is taken second by the aid of the clock. A weight is placed in a candle-holder pan equal to the standard quan-tity of sperm due to the time it is intended to make observations; for ten minutes, the weight would be 40 grains for two candles. Then comes the actual photometric experiment, which consists in moving the saddle to a position on the rod, in which both the reflected images of the sides of the screen appear equally illuminated. A reference to the scale on the rod gives the illuminating value of the gas flame as compared with two candles. One such observation is made for each minute, and the mean taken as the observed value of the gas. A watchful eye is kept upon the balance during the ninth minute, and when it again turns the time is taken, as at first. The difference between the times is, of course, the time occupied in consuming 40 grains of sperm. Another method is to weigh the candles, then light them promptly at any observed minute, use them for the complete minutes, and then suddenly extinguish and reweigh; the difference is the number of grains burned in ten minutes.

If it be assumed that the photometer indicated the value of the gas flame 12.8 candles, and that the candles burned 40 grains in 580 secondstime due to such consumption being 600 seconds it would be assumed that the candles gave more than a standard light, and the value of the gas would be raised by direct proportion to 13:24 candles:—580:600::128:13:24. A similar correction is made if the candles exceed the due time, and in this case the observed value of the gas would be reduced. In the second system of weighing, if the candles burned 41.38 grains in ten minutes in-stead of forty, taking 12.8 as the observed value of the gas, as before, the correction would be made in terms of grains—40: 41:38::12:8:13:24. The terms of grains—40:41:38::12:8:13:24. The gas referees lay down a condition that no test of gas referees tay down a condition that no least of illuminating power is to be recorded in the City test-ings in which the candles vary more than five grains each per hour from the standard rate of 120 grains per hour. The author's experience leads him to doubt whether sperm candles can be regularly produced by any means which will comply with this requirement.

It has not been usual in testing gas on behalf of the public, or indeed generally, to correct the volume for temperature and barometric pressure, but the referees have directed such corrections to be made, and the volume of gas as measured by the meter is to be reduced to a standard volume at 60deg. Fahrenheit and 30in. barometer. Five cubic feet of gas at 56deg. and 30:5in. would at 60deg. and 30in. measure 5:125 cubic feet; its denwould be greatest at 56deg. and 30-5in.; and it would give more light than five feet at 60deg, and 30in. The value of the gas would be reduced from 13·24 to 12·91 candles for 5·125:5::13·24: 12.91

Tables are used for correction of volume, which are identical with those published by Mr. Alexander Wright for use with his specific gravity apparatus. In theory, the correction of volume is right, and the author thinks such correction should be made, but some persons may dispute whether this refinement is necessary in commercial testings. Sometimes the gas company, and sometimes the public, will be put at a disadvantage by it, and it may be said that the commercial value of gas is dependent upon the light it yields under existing circumstances, and not upon what it would give under theoretical conditions.

(To be concluded in our next.)

### METROPOLITAN DISTRICT RAILWAY.

ON Tuesday last, Colonel Yolland, of the Board of Trade, inspected another section of the Metropolitan District Railway, which has been completed, and will be opened for public traffic on Monday next. The new portion consists of a double junction, uniting the western portion a double junction, uniting the western portion of the inner circuit at Gloucester-road, Brompton, and at Kensington, High-street, with the West London Extension line at West Brompton, and at a point about midway between that station and the Addison-road station on the same line. The two junctions have each double lines of rails, and are together about 24 miles in length. The Metropolitan Western Extension line terminates at South Kensington station, where it runs into the Metropolitan District line, that continues the cir cuit from that station eastwards. From South Kensington station, the Metropolitan is duplicated by the District to the Gloucester-road station, at a little beyond which the junction line curves round to the left, and passing Earl's-court in a westerly direction, again curves round to the south, and forms a junction with the West London Extension at the West Brompton station. The northern junction commences at the double station on the inner circuit at Kensington, High-street, and passes for a short distance alongside of the circuit, then strikes off by a wide curve in a south-westerly direction, and joins the southern junction near Earl's-court, where the four lines run alongside of each other for about half a mile, at the end of which, the lines again fork, the northern junction curving round to the right, passing under the West London Extension, and forming a junction with that line to the south of the Hammersmith-road. The junction lines are constructed thoughout in the open, although in deep cutting, excepting only a rather long covered way in the diverging curve

the West London line is by gradients of 1 in 62. Several double bridges are carried over the lines, to carry, amongst others, the roads known as Cromwell-lane, Spicer's-road, Raspberry-lane, Earl's-court-road, and the Warwick-road, with occupation bridges communicating with the triangular pieces of land between the curves at the junctions at each end. The permanent way is of the same excellent character as that upon the inner circuit, the rails being steel, and 85lb. to the yard There are eight sets of points for the two double junctions in the straight run at Earl's-court. The interlocking point and signal apparatus at this place are on the patent of Mr. F. Brady, of the South-Eastern, supplied by Messrs. Vickers Sons and Co. The point and signal apparatus at the and Co. The point and signal apparatus at the West London junction end, are by Messrs. Saxby and Farmor. The works, which are of the best description throughout, were laid out by Mr. John Fowler, ongineer-in-chief to the Metropolitan, with Mr. T. Marr Johnson as joint engineer. Messrs. Kelk, Waring Brothers, and Lucas, have executed the works as contractors. A neat and commodious station has been erected at West Brompton, but for the present, the erection of the contemplated station near the Hammersmith-road contemplated station near the Hammersmith-road will be deferred.

#### THE TOWER SUBWAY.

MONGST the many great improvements now going on in London to relieve the overcrowded state of traffic, and for opening up new means of communication, the Tower Subway is one which deserves especial notice, as forming an easy and safe connection between the two densely-populated districts situated north and south of the Thames, between London Bridge and the Thames Tunnel. This work is now in course of construction under the bed of the river, from Tower-hill to Tooley-street, and consists of a tunnel less than to looky-street, and consists of a tunno loss that a quarter of a mile in length, access being gained to it by a shaft at each end. The depth of these shafts will be 52 feet and 60 feet respectively, in which it is proposed to have plumb lifts for the transit of passengers, parcels, &c., to and from the subway, through which an omnibus running on steel rails is propelled, both being worked by steam power. In driving the subway, which will be about 22 feet below the bed of the river, a wrought-iron shield will be employed overlapping the tunnel, provided with doors in the front, through which workmen can drive the heading, but which can be immediately closed on any appearance of water, and so render all water-tight; this shield will be propelled by powerful screws, and as it progresses, the tunnel segments will be inserted. The whole of the work is under the superintendence of Mr. Peter W. Barlow, jun., C.E., the engineer; the contractor being Mr. J. H. Greathead, under whose superintendence the shafts are now being sunk by Mr. Thomas Tilley, of 2, Bond-court, Walbrook London, the well-known artesian well engineer The castings for these shafts and the tunnel, which are all made in segmental rings firmly bolted together, as also the manufacture of the shield, are entrusted to the firm of Messrs. Bells, Good-man, and Co., of the Walker Engine Works and Foundry, Newcastle-upon-Tyne, and 25, Walbrook, London. The Tower Subway was commenced on the 16th of last February, and as the shaft for the Middlesex side is already sunk to the depth of 60 feet, and the remainder of the work well advanced, we are informed that it is expected to be opened to the public before the commencement of the year 1870.

### THE LONDON ASSOCIATION OF FOREMEN ENGINEERS.

THE members of this institution met on Saturday, the 3rd inst., in their new hall at the City Terminus Hotel, and the assemblage was much more Terminus Hotel, and the assemblage was much more numerous than at any previous monthly meeting. The chair and vice-chair were filled by Mr. Newton, of the Mint, and Mr. Keyto, respectively. The first business consisted in the election of Mr. James Douglass, Chief Engineer to the Trinity Board, and Mr. W. Munro, of Lambeth, as honorary members, and of Messrs. T. Hughes, J. F. Wolff, J. E. Reed, H. Noble, R. Wood, and J. Bates, as ordinary members; Messrs. W. Fothergill, and W. Price, were also put in nomination for membership in the ordinary class. ordinary class.

Mr. Newton then proceeded to deliver an address. He commenced by congratulating his fellow members upon the advancement—steady, and apparently cernear the South Kensington station, and the passage under the West London Extension. Excepting at this part of the new line, the gradients are practically level; the descent and ascent in passing under the ways so well adapted for their monthly gatherings. It was in 1855, when the society was in its infancy,

and when it was regarded with a considerable amount of jealousy and distrust by employers, that he (Mr. Newton) had joined its ranks, and he was thankful he had lived to witness its development to the present state, and the disappearance of every vestige of antagonism to it on the part of the master engineers of the kingdom. To the scientific Press of London much of the success of the Association was due. Through its medium the transactions of the society were made known to the engineering community at large, and its internal mechanism and its springs of action explained. The inner life of the institution, and its peculiar blending of scientific the institution, and its peculiar blending of scientific investigation with benevolent design, had thus been revealed, and its adaptability for technical and pracinvestigation with benevolent design, had thus been revealed, and its adaptability for technical and practical purposes demonstrated, until, at last, the principal employers of London were among the firmest friends of the Association. This, Mr. Newton said, was matter for extreme congratulation, but there was still work to be done. It seemed impossible for individuals trained, as foremen were, in the workshop, not to be geognizant of the value as well as the dignity of labour, and labour was still essential to the prosperity of that society. Their larque had tided over many shoals, and escaped many quicksands, but the sea of public life abounded in hidden as well as patent dangers, and it was necessary always to keep a good look-out, and that the crew should, one and all, be prepared to do their duty. Hitherto, some of the ship's company had merely lounged upon the deck, and contributed little towards bringing the vessel into harbour. He heped that the idle members of the past would become the active workers of the future, and then, humanly speaking, all must go well with that institution.

Mr. Newton adverted to the gratifying fact that Dr. Percy and Professor Tyndall had promised papers on future occasions, and that thus there would be a welding, as it were, of scientific deduction and practical knowledge in their proceedings. By co-operation of this kind all would be benefited intellectually, and the information gained at the meetings would be utilized in the factory, so as to be made advantageous to employers. In conclusion, the chairman appealed to honorary members to come

meetings would be unified in the factory, so as to be made advantageous to employers. In conclusion, the chairman appealed to honorary members to come forward and assist the society by reading papers, and by joining in discussions. They might enter that hall without any sacrifice of dignity, and their presence would be hailed with the greatest satis-

The foregoing is but a brief resume of the chairman's address, which was listened to throughout with close attention, and applauded at its close. Mr. Robt. B. Vinicombe, of the Royal Arsenal, Woolwich, followed with a paper on "Gunpowder Machinery." This was of a thoroughly practical nature, and the whole of the processes connected with the production of the death-dealing compound were admirably explained by the author. The paper was copiously illustrated with diagrams, and was altogether calculated to enrich the transactions of the institution. The proceedings of Saturday were protracted to a late hour; but Messrs. Keyte, Irvine, Humes, and others, took part in the brief discussion which followed Mr. Vinicombe's paper, and votes of thanks to that gentleman and Mr. Nowton concluded the meeting. The foregoing is but a brief resume of the chair-Newton concluded the meeting.

# LEWTHWAITE'S PATENT MAGNETIC STEEL SHARPENER

WE have just had brought under our notice a very WE have just had brought under our notice a very excellent and simple instrument for giving an immediate and highly finished edge to knives, razors, scissors, surgical and all other cutting instruments. This wonderful little sharpener is the invention of Mr. J. Lewthwaite, of 33, Museumstreet, Bloomsbury, who is well known as the inventor and patentee of the celebrated railway ticket printing machine which was exhibited by Messrs. Waterlow and Sons at the International Exhibition of 1862, and to which was awarded the prize medal. These machines have attained great popularity, being largely in use all over the world. The sharpener owes its very peculiar properties to the introduction of the magnetic steel sand of Taraniki into its composition. A trial of this remarkably efficient and cheap fastener, both upon knives and scissors, enables us to speak confidently of its merits. It can be carried about in the waist-coat pecket, although larger sizes are made for household purposes, and its price is so low as to bring it within the reach of even the schoolboy with his first knife.

# Correspondence.

THE NITRATE OF SODA PROCESS.\*
MR. BESSEMER'S PROCESS.\* PROCESS AND

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I was one, of not many persons, who, upon the first announcement of what is called "the Bessemer process," but which should, in strictness of fact and language, be rather called "the Martien

• Patent No. 2082, A.D. 1855.



process with the Bessemer vessel," predicted that that process would fail in doing what it professed to do, namely, eliminate the sulphur and the phosphorus from cast iron. I did not witness the feu d'artific. of Mr. Bessemer's original converting vessel, which seems to have dazzled so many of the profanum vul m., but I saw a faithful representation of it at the Polytechnic Institution, where we had, as announced in the bills, "the Bessemer process every night." I saw, also, the samples of iron produced by that process, which, had I needed it, confirmed my previous opinion. This opinion was based simply upon our long and ample experience of the failure of the old finery to discharge those impurities by blowing air downwards into the metal, and common sense told me that the chemical action of the air blast could not be changed by the change from a downward to an upward current, although it might burn more carbon and more fron in its course. At the same time, I always anticipated that Mr. Bessemer would succeed in producing a valuable metal from the purer kinds of cast iron.

Now, I own that my attention was first directed by the above failure (to eliminate sulphur and phosphorus) to this great metallurgical problem. I began by considering for what bases phosphoric acid, if it could be formed from the phosphorus in the metal, would have the greatest affinity, and I soon saw that seda was one, not to mention that soda would liquefy the scorie, and leave the iron cleaner than it would turn out from a more viscous cinder. All that I now wanted was nascent oxygen to form phosphoric acid, and nitric acid at once offered me this element; while the nitrate of soda containing it inis a substance most abundant in nature, and not sexcessive in price. This, of course, decided me at once to adopt it. But I wished to increase, if possible, the number of bases offered to the nascent phosphoric acid, and with it the chances of its formation. I recollected the contract of the chances of its formation. phosphoric acid, and with it the chances of its forma-tion. I recollected two facts favourable to this precaution—first, that "phosphate of alumina" had been found by analysis in iron scorie; and, second, that that most elegant of minerals "wavellite," is a native "phosphate of alumina." I, therefore, in-troduced a minute dose of kaolin, as affording that as probably leading to a "phosphate of lime," also a natural production. (I threw in nitrate of potash, though too dear for such a purpose, only to obviate though too dear for such a purpose, only to obviate any infringement under colour of employing it). any infringement under colour of employing it). These calculations and trials on the great scale having been completed. I solicited and obtained my patent, No. 1921, A.D. 1851, and I specified for the use of these several reagents in the puddling furnace, reserving my claim to the use of nitrate of soda, as a general purifier and converter of cast iron, for another patent which I subsequently obtained. My reason was this:—Martien had, in a most extra-ordinary specification, claimed the monopoly, by an abuse of general terms, of almost every salt known to chemistry, nay, of "any mineral or vegetable substance," and, thinking that I might give him a substance," and thinking that I might give him a peg on which to hang litigation, I disclaimed the use of any of my reagents in his "gutter process;" in short, I made him a present of whatever advantage he might contrive to extract from his generalities. Subsequent reading and reflection have taught me that I then had nothing to fear; that in patent law according to the process of agency let the spreads of the process of the strength term spreads. that I then had nothing to fear; that in patent law no one can, by the mere use of a general term, spread the net of a specification over the labours of future inventors, which, of late, it has been too much the fashion to attempt. To "specify" is the very opposite to "generalizing." The claims must be specifically made for what is in esse, not for what is in posse, and whether this can or cannot be comprehended under a general term makes no difference. We shall see some of our forestalling patentees come to grief upon this point before long, or I am much We shall see some of our forestalling patenties come to grief upon this point before long or I am much mistaken. In Betts v. Menzies, upon appeal to the House of Lords, the judges, in their answer to the lords said, "even if there were identity of language in the two specifications, if such identity consisted merely in terms of art, it would be impossible to predicate what meaning the first patentee attributed to such terms. . . . A mere barren general description, although it might contain an important suggestion, which a future inventor might avail him-self of, could not be considered as anticipatory of a future patent, although the terms describing the invention might be identical,—the one merely suggested the invention, while the other, by reducing the theory to practice, added to the amount of human knowledge, and conferred a benefit on mankind within the meaning of the patent laws." This language is conclusive, and I have quoted the words as a warning to patentees who put forth such pre-posterous claims as Mr. Martien's, to "all car-bonates, chlorides, nitrates, &c."

To return: I then obtained my second patent for the use of nitrate of soda as a purifier and converter of cast iron. I knew very well, from numerous trials, that to give my salt its full power as a reagent, it was necessary to imprison it, as it were, below the metallic bath, and so to counteract for a time its smaller specific gravity, and I was occupied in devising various adjustments for the purpose, when a cruel fraud to a large amount compelled me to abandon together my business and my patents. It will be seen, I trust, before long, how

far I had carried to perfection this important application, by methods which for years I have kept secret. In the meantime, I feel bound to yield the palm of priority to Mr. Heaton (he has done what I was then attempting to do), to whose inventive talent and merit I have given the highest testimony in my power, by joining the board of his company.

But I cannot conclude this communication without noticing the most extraordinary claim put forth by Mr. Bessemer, in his recent correspondence with Mr. Heaton, a claim not perhaps distinctly asserted but, at least, so suggested as to lead the unwary to take it for granted. He uses these words ("Times" money article. December 19, 1868):—" In the latter part of his letter, Mr. Heaton triumphantly points to the fact that I have taken out three patents for the use of nitrate of soda, and wishes, therefore, to infer that I approve his system. Now, Sir, the explanation of this point I should not have touched upon did I not feel that it was an imperative duty on my part not to conceal facts which so deeply affect the public interest; and that these facts may be clearly understood, I must go back to my patent of 1856, in which I declare my invention to consist in acting on a mass of melted crude or cast iron, when in a suitable vessel, by streams of oxygen (contained in atmospheric air or otherwise), and without the farther consumption of fuel for heating the vessel or into tseel or malleable iron. Now, whenever nitrate of soda is placed on the lower part of a suitable vessel and is covered by a perforated plate, the heat of the fluid pig iron, when poured on to the plate, will rapidly decompose the nitrate of soda, and 'streams of oxygen' will pass upwards, and (to use my own words) 'convert such crude or cast iron into steel or malleable iron, without the further consumption of fuel for heating the vessel or the iron.'"

Has Mr. Bessemer ever considered to what this construction of his specification must infallibly lead? Why, it leads simply and directly to his monepoly of almost every chemical substance known in nature. For, with the exception of not more than half a dozen, all occur as oxides or as saits of oxides, ready to give out these "streams of oxygen" when any future inventor shall have pointed out their use and importance! Difficult as it may be to perceive what "public" interest is involved in this claim, or what interest of any kind, save that of Mr. Bessemer himself, no one can doubt that by these words Mr. Bessemer intends to convey the notion that he had nitrate of soda within his purview when he specified in 1856. If he had, will any one believe that he, a man so keen in fencing round the so-called "Bessemer" process with the brambles of patent law, would have neglected to describe accurately and to define in unequivocal terms an application so important? Instead of this he is silent on the subject; he waits until another inventor has obtained two patents for the use of the nitrate salt, and not until these two patents have alpsed does he come forward and attempt to monopolize, by a nonessential mode of application, the use of that reagent. If he says that he had not this in view, then the case of Bette p. Menzies is directly in point and applicable to this covert and anticipatory language, and in any case he must give some proof in fact that such was part of the process actually employed by him in 1856. Now, I can state positively that at, or about, the time when I was engaged in drawing my own specifications, Mr. Bessemer was sending to my works ingot after ingot of his steel which would not stand the hammer, or "draw clear," and, as it seemed to me, was almost in despair at their failure. Such being the case, does Mr. Bessemer mean to suggest to the public that, at an epoch in his fortunes so very critical, he had the smallest idea of the power and efficiency of the nitrate of soda process? Either he had or h

And, now, having done with the language of his specification, and his suggested claim as arising upon it, I come to the operation itself, and, as a matter of science, deny most emphatically the existence of any "streams of oxygen" at all, arising from nitrate of soda, either submerged under molten iron, or blown into it. It is an entire misdescription, proceeding upon as entire a misconception of the real phenomena developed in the process. The reaction consists of

a series of detonations, or flashes, as of gunpowder, in which, at one and the same moment, or at successive moments quite undistinguishable in time, the mascent oxygen and the phosphorus unite, and the phosphoric acid so formed unites with the soda base, while the nascent nitrogen (which Mr. Bessemer has quite ignored) does its part as a steel-making element. Nay, more, if Mr. Bessemer did obtain his imagined "streams of oxygen" in a merely physical as contra-distinguished from a chemical condition, they would help him no more than his streams of common air to eliminate the phospherus and the sulphur, and, what is worse, they would leave behind them the most important element, the soda base, for the phosphoric acid to unite with at the instant of its formation. See Professor Miller's analysis of Heaton scoriae. The nitrate salt is the real steel-making agent in his operations; and let him be assured that, mask it as he will by blowing it in with air, no one pretending to the least knowledge of chemistry will fail to perceive that, while the air, in burning in part the carbon and the metal, evolves much of the requisite heat, it is the chemical reagent that does the work of purifying and converting the metal into steel. Let Mr. Bessemer try a current of pure oxygen gas (obtained from peroxide of manganeso or peroxide of barytes), and the failure will at once convince him of his error. Of this I have had the most complete and conclusive proofs in the production of some hundreds of tons of iron and puddled steel from the very worst and most impure cast iron both of England and of the Contineut, in bars which you might bend, but could not break; which you could twist, hot or cold, into any form without a flaw, and of which I retain some most striking samples. No air whatever was blown into or upon the metal so treated.

I have a further proof of the singular power and efficiency of this reagent in the fact that simply operating in the great ladle of the foundry in Her Majesty's Dockyard at Portsmouth, I produced castings which by trial gave a tenacity of from 12½ to 25 per cent. greater than the selfsame metal treated in the ordinary way. Where was the air blast in these decisive assays? Now, if we find that the air blast alone will not produce true steel, while nitrate of soda alone will produce it; and while nitrate of soda driven in by an air blast equally produces it, sound principles of induction mark that nitrate of soda is the really operative element. "What, then," it may be asked, "has Mr. Bessemer really himself dono?" I answer that he has done more than enough to establish a reputation. He took Mr. Martien's modification of the old finery in the blowing of air upwards through the metal instead of downwards, where it had to work at a disadvantage; and he invented a vessel in which this process could be practically applied to a pure metal. Finding that the blast did no more to eliminate the sulphur and phosphorus than the old finery blast, he wisely abandoned the insoluble problem and restricted his operations to cast iron free from those impurities. Baron Gruner says that what Mr. Bessemer produces is "not a true steel!" Be it so; but if Mr. Bessemer has not produced a true steel, still, if he has produced a new and highly useful and durable quality of iron, he has made a great step in metallurgy. But, ne suter ultra crepidam! Let him be contented with this, his own undisputed territory, and not seek to annex territories to which he cannot make a good and valid title.

There is another singular claim made by Mr. Bessemer, of which I should like to see some explanation, for I can hardly think that it is to be taken literally. He says (in the same letter to the "Times") "one of the conditions of my claim, however, is the retention of the malleable iron or steel in a fluid state, and the pouring of it while still fluid into ingot moulds." Now, what I want to know is this,—if I, by a process of my own invention, be it open to the public or not, wholly or in part, make malleable iron or steel in large quantities in a great ladle (and what is Mr. Bessemer's present vessel but a great ladle?) am I not at liberty to pour it into any mould that suits my purpose without a licence from him? From the grain of what I made in the foundry of Portsmouth Dockyard and elsewhere (and this was prior to Mr. Bessemer's pouretents) I should call it "steel," and it was all poured into various moulds again. When I have got my steel in the fluid state, can't I keep it so by means of heat suitably applied, without Mr. Bessemer's consent?

One more point and I have finished this critique. Mr. Bessemer says that he converts his cast iron without fuel." But is this so? He melts his cast iron: so does the old finery; and, of course, the same weight of metal requires the same weight of fuel. Now, Mr. Bessemer assumes that it is the superincumbent coke which heats the metallic bath in the finery. But, I say, and I can prove, that, after the metal is melted, this is not the fact. The finery cinder, which is thrown off in large quantities at the expense of the metal, just as in Mr. Bessemer's operation, is a silicate of the protoxide of iron. Whence comes this protoxide? Why, from the action of the air in the highly inclined blast which goes down into the very body of the metal, and, in

the oxidation of it, gives out the very heat obtained by Mr. Bessemer when he burns the same weight of metal! I have not the least doubt that we might metal! I have not the least doubt that we might remove the whole of the coke in the finery, as soon as the metal is melted, without any change in the results, which would bring us very near indeed to Mr. Bessemer's operation as now employed. Upon the whole, looking to these facts and phenomena, I cannot resist the conclusion that if Mr. Bessemer's I cannot resist the conclusion that, if Mr. Bessemer's present mode of blowing air downwards into melted cast iron (as I apprehend that mode) should become the subject of judicial enquiry, it will be held to be essentially the operation of the old finery. I abandoned my patent for a dipping tuyere which preceded Mr. Bessemer's on this very ground. I will only add that I have no longer any pecuniary interest in this matter (my patent having long ago lapsed) save that which I share with the general public, namely, that Mr. Bessemer should not be permitted, by raising a mist of non-essential adjustments and details around my nitrate of soda process, to re-erectit into a monopoly for his own private gains conclusion that, if Mr. Bessemer ments and details around my nutrate of sous process, to re-creetit into a monopoly for his own private gains at the public expense and mine.—I am, Sir, yours, &c.,

F. C. Knowles. Ryde, Isle of Wight, March 22.

### RAILWAY TRAIN COMMUNICATION.

RAILWAY TRAIN COMMUNICATION.

SIR,—I perceive by the public journals that "the rope system" of communication between passengers and guards is about to be adopted on all railway trains travelling more than twenty miles an hour. My impression has always been that this method, in the long run, would be found the cheapest, and most sure; and I think I was the first to advocate it, in a letter to your journal in or about the year 1840, under the signature of "Viator"; and I proposed also that the rope should run along under the eaves of the carriages, with openings in the pipe over the windows.

windows.

I should certainly then have tried the plan on one of the railways, but that in answer to my application to do so, the general manager of the Railway wrote me "it will never do to have every old woman pulling the string"; but I suppose, by this time, old women are more used to railway travelling, and general managers think they may be trusted.—I am, Sir, yours, &c. Andrew B. Brandram.

10, Eliot-place, Blackheath, S.E., April 3.

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 1s. 8d. yearly, or 10s. 10d. half-yearly, payable in

advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE. To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

ments should reach the only at the first should reach the only communitations and solutely decline attending to any communications anaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good

faith. ED. M. M.
Advertisements are inserted in the MECHANICS' MAGASINE, at the rate of 6d. per line, or 5d. per line for 13 insertions, or 4d. per line for 26 insertions. Each line consists
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### Meetings for the Week.

Tues.—Royal Institution.—Professor Grant on "Astronomy," at 8 p.m.

The Institution of Civil Engineers.—Mr. T. N.
Kirkham, M. Inst. C.E., on "Experiment for the Standards of Comparison Employed for Testing the Illuminating Power of Coal Gas,"

at 8 p.m.

Testing the Huminature
at 8 p.m.
Who.—Royal United Service Institution.—Mr. George
Campbell, Bengal Civil Service, on "The
North-West Frontier of India," at 8.30 p.m.
Thurs.—Royal Institution.—Professor Tyndall on "Light,"
at 3 p.m.
Fal.—Royal Institution.—Mr. William Carruthers on
"Cryptogamic Forests," at 8 p.m.
Sar.—Boyal Institution.—Mr. A. Geikie on "Geology,"
at 8 p.m.

## Babal, Military, and Gunnery Items.

In order to prevent soldiers who have joined the reserve force enrolling themselves a second time by means of mutilated certificates of service, commanding officers have been requested not to issue more ing officers have been requested not to is than one certificate to a discharged soldier.

THE good service pensions of £150 a year each, vacant by the promotion of Captain W. K. Hall and Captain Thomas Wilson to the flag list, have been awarded to Captain Henry S. Hillyar, C.B., and Captain George Hancock.

THE Glasgow journals state that Messrs. J. and THE Glasgow journais state that messrs. J. and G. Thomson have received orders from Messrs. Burns and MacIver to construct two large screw steamers of upwards of 3,000 tons each for the Atlantic mail service. The new steamers are to be named the "Abyssinia" and the "Algeria."

IT is announced through the Atlantic Cable that It is announced through the Atlantic Cable that Sir Edward Cunard, Bart., died suddenly, from heart disease, in New York, on Tuesday evening. He was fifty-three years of age, and a principal partner in the house of Messrs. Cunard, Burns, and partner in the house of Messrs. MacIver, the steam ship owners.

An Admiralty order has been received for the An Admiraty order has been received for the closing of two of the three gates of Greenwich Hospital, at which visitors and the inmates have hitherto been admitted to the building. This is calculated to effect a saving of about £600 per annum, in reducing the number of metropolitan police employed from seventeen to seven.

THE Board of Trade have awarded a binocular The Board of Trade have awarded a dinocular glass to Captain Julius Martin Marcusson, of the Norwegian ship "Kongs Verre," for rescuing the master and crew of the barque "Viking," of Picton, Nova Scotia, on January 23, 1868, and conveying them to New York, having them for fifty-three days on board his ship.

SEVERAL instances have recently occurred in SAVERAL INSLANCES nave recently occurred in which officers on leave from regiments on foreign service, when required to perform duty in this country, or on the return voyage, have stated that they are without uniform; it has in consequence been directed in general orders just issued that officers are always to be in possession of their uniform; otherwise, if detailed for duty, they will be required to provide themselves with a fresh outfit.

An order has been issued from the Admiralty that all ships of war carrying twin-screw engines are to have their machinery fitted with Silver's steam governor. The largest vessel driven by twin screws in Her Majesty's navy at present in commission is the "Penelope," 3,096 tons, 600-horse power. The official reports from this vessel are highly favourable as regards the beneficial action of the steam governor at sea, especially in rough weather.

A GENERAL order, just issued, authorizes officers, non-commissioned officers, and soldiers who have received medals from the Royal Humane Society for acts of bravery in saving life to wear them on all occasions when in uniform. In all cases when an officer, non-commissioned officer, or soldier may be deemed worthy of receiving a second mark of distinction for saving life the Royal Humane Society have, with the concurrence of the Field-Marshal Commanding-in-Chief, agreed to add a clasp or bar to the medal already granted.

THE "Pall Mall" gives the following as an authentic anecdote of the late review at Dover:—
"When the 'Ferret' had, shortly after drifting against Dover Pier, become a complete wreck, signals were made from the shore to the Royal Sovereign, the flag-ship of the senior officer in command, informing him of the fact, as well as of the safety of the great with the expention of one boy. Costain the crew, with the exception of one boy. Captain Hood at once telegraphed the information to the Hood at once telegraphed the information to the Admiralty in London, and received in reply orders from that body to take the Royal Sovereign into Dover Harbour. Now, inasmuch as the entrance to the harbour is too narrow to admit the Royal Sovereign, and as, until after the half-tide, even the packet boats have often a difficulty in finding enough water to float them, the task was a difficult as well as a dangerous one to perform. Luckily, Captain Hood thought it best to act on his own responsibility."

This Board of Trade have awarded a gold watch to Captain J. De Waard, of the Dutch brig "Santa Rosa," in recognition of his services to the master and crew of the ship "Calumet," of Liverpool. The "Santa Rosa" fell in with the "Calumet" on November 16, 1868, in a sinking condition, in lat. 40.21 N. and long. 18.19 W., and received her master and crew, 32 in all, on board, landing them at Madeira on November 21. To effect this she was obliged, in consequence of the large number of persons on board, to deviate considerably from her course. The board have also awarded a telescope to Captain J. Lorange, of the Norwegian ship "Wilhelm Ludvig," for rescuing the crew of the bark "Enchantress," of Sunderland, in January, 1867. The "Wilhelm Ludvig," fell in with the "Enchantress" on January 10, about sixty miles S.W. of the Land's End, with her rudder broken, and in a sinking condition. She received the master and crew of the disabled vessel on board, and brought them in safety to St. Michael's Mountreads.

## Miscellanen.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending April 3, was 14,876. Total number since the opening of the Museum, free daily (May 12, 1858), 1,542,820.

AT the ordinary meeting of the Society of Engineers held on the 5th inst, Mr. F. W. Bryant, President, in the chair, a paper was read on the methods employed in the determination of the commercial value and purity of coal gas. by Mr. F. W. Hartley., weich we give in auother column.

Cop fish skin, heretofore considered quite worthless, and given away to any one who would take the trouble to haul it, is now, after having been ground fine, to be used as a fertiliser. This new kind of guano is said to be free from the disagreeable odour of the ordinary fish manure.

THE journals of Brunn, in Moravia, state that a Jewess, who lately attained the respectable age of 100 years, felt the other day a pain in her guns, which was soon after found to be caused by the appearance of four new teeth, which were forcing their wav down.

At the general monthly meeting of the Royal Institution of Great Britain, held Monday, April 5, 1869, Sir H. Holland, Bart., president, in the chair. Mr. Charles Chapman, Mrs. Cunliffe, Messrs. Walter Graham, Archibald Hamilton, and Henry Stone were elected members of the Royal Institution.

Eighteen Cornish engines were reported last month. These consumed 1,468 tons of coal, and lifted 11.7 million tons of water ten fathoms high. Average duty 53,700,000lb. lifted 1ft. high by the consumption of 112lb. of coal. Seven engines exceeded the average duty.

According to the official report of the harbour naster of Callso, the number of vessels which left that port during 1868, laden with guano from the Cincha Islands, amounted to 358. The quantity of guano which was exported during the year was estimated at 300,000 tons.

THE exports of coal from Belgium to France, in THE exports of coal from Belgium to France, in 1866, amounted to 3,226,378 tons, as compared with 3,014,452 tons, in 1867, and 3,393,649 tons in 1866. The quantity of coke exported from Belgium to France last year was 193,131 tons, as compared with 232,984 tons in 1867, and 292,793 tons in 1866.

At a meeting of the Board of Works last Friday it was determined that before sanctioning any scheme of tramways in the streets of the metropolis it would be desirable to have an experimental line between Westminster Bridge and Kennington Park, and the solicitor of the Board was directed to confer with the promoters of the bill before Parliament with a wing of making averagements for that approximation. view of making arrangements for that purpose

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending April 3, 1889, (Easter week free) was—on Monday, Tuesday, and Saturday from 10 a.m. to 10 p.m., 32,297; Meyrick and other galleries, 7,990; on Wednesday, Thursday, and Friday from 10 a.m. till 10 p.m., 10,757; Meyrick and other galleries, 3,310; total, 54,354. Average of corresponding week in former years, 25,747. Total from opening of Museum, 8,318,624.

In 1867 the total population of Cuba was 1,370,000 In 1867 the total population of Cuba was 1.370,000—of which 764,500 were whites and 605,550 were coloured. Of the coloured population 226,000 are designated as of the free class, but this includes, besides the freemen of negro blood, a large number of Chinese. More than three-fourths of the population, white and black, are in the western department, where the insurrection has as yet hardly made its appearance.

appearance.

INTELLIGENCE is to hand that a gold nugget weighing not less than 2001b. troy, has been found in Victoria. It is doubtful whether so large a quantity of the precious metal has ever been found before in one mass. The great nugget of 1858 weighed only 1461b. It is noticeable that all these great lumps of gold have been found in Australia. In 1730 a nugget, thought at that time to be immense, was turned up at Peru, but it weighed not more than 601b.

at Peru, but it weighed not more than 60lb.

ADDED to the changes in the Government departments at Woolwich, is the proposed abolition of the Royal Military Academy, which has held a high rank among the military educational establishments of the country. The school, it is stated, will be amalgamated with the Royal Military School, Sandhurst, and the building at Woolwich devoted to the purposes of advanced military instruction for the Royal Artillery. The Herbert Hospital at Shooter's-hill is to be given up, and the inmates housed in the Royal Marine Infirmary at Woolwich, which is at present unoccupied. For the future the Royal Marine Infirmary will be constituted a general hospital for regiments and corps of all branches of the service.

An interesting boatrace took place on Saturday after-

An interesting boat race took place on Saturday after-Aninteresting boatrace took place on Saturday afternoon between four homeless boys of Her Majesty's ship "Chichester," and four picked men from the Prussian man-of-war paddle steamer "Adler," at Greenhithe; the course was from the "Chichester" past the "Adler" and round the lower swinging buoy at Greenhithe, a distance of two miles, and back to the "Chichester." The lead was taken and kept throughout by the homeless boys. who, after a hard and "Chichester." The lead was taken and kept throughout by the homeless boys, who, after a hard and
exciting race, won by about six boats' lengths amid
the hearty cheers of their 200 messmates. The
race was watched with great interest and anxiety by
the officers and crew of the Prussian iron-clad frigate
"King William," moored at Greenhithe, who were
rather surprised at the result.



AT the meeting of the Institution of Civil Engineers, on Tuesday, the 6th inst., Mr. C. H. Gregory, President, in the Chair, ten candidates were balloted for, and declared to be duly elected, including one Member, viz.:—Mr. William Adams, Locomotive Superintendent of the North London Locomotive Superintendent of the North London Railway, Bow; and nine Associates, viz.:—Mr. W. F. Badgley, Mr. Arthur Carpmael, Mr. William Hackney, B. Sc., Mr. F. H. Hambleton, Mr. T. C. Hambling, Mr. B. Knorpp, Mr. W. F. Lawrence, Lieutenant R. A. Sargeaunt, R.E., and Mr. G. F. Verdon, C.B. It was also announced that the Council had admitted as Students of the Institution, Massers Happy Cartor, W. A. Dayron and J. H. R. Messrs. Henry Carter, W. A. Dawson, and J. H. R. King.

On Wednesday last, their Royal Highnesses, Princesses Louisa and Beatrice, attended by Lady Caroline Barrington, Mdlle. Bauer, Mdlle. Norelle, and Major-General Francis Seymour, C.B., honoured the Royal Polytechnic Institution with their presence, to hear Professor Pepper's lecture on and witness the experiments with the enormous induction coil by Mr. Apps. Their Royal Highnesses were received by the Chairman and Directors of the Royal Polytechnic Institution, at the private entrance, 5, Cavendish-square, and conducted to the royal box, which was fitted up in an elegant manner by Messrs. Druce and Videon. They retired evidently pleased with and Videon. They retired evidently pleased with the exertions of Professor Pepper and the Directors to entertain them on this occasion. We briefly described this great coil in our issue for the 25th ult. and propose next week to give a further account of both it and its mention. both it and its working.

At the meeting of the Royal Horticultural Society, held on Tuesday, the most prominent amongst flowers was the splendid show of roses from Mr. William Paul. Mr. C. Turner exhibited a very pretty Coleus, Princess Royal. A form of rhododendron Brookeanum was remarkable as a splendid specimen of cultivation. The collection of cucumbers which competed for the prizes offered was magnificent. Major R. Trevor Clarke presided, and the following candidates were elected fellows, viz.:—Henry Blaine, Mrs. Francis Coltman, Geo. Dixon, M.P., Henry J. Dixon, William Finnie, M.P., Francis Fuller, Alfred Gillett, Mrs. G. W. Lenox, Mrs. David Moore, Philip Saillard, Captain Gordon Shute, William Swinsoow, Henry Toogood, Charles Clement Tudway, &c. Messrs. Lane and Son's annual exhibition of spring flowers, now open in the arcades, will continue until the 17th inclusive, on which day the second spring show takes place. AT the meeting of the Royal Horticultural Society the second spring show takes place.

## Mutents for Inbentious.

### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

ment:—
BOILERS AND FURNACES—2899, 2915, 2930, 2967
BUILDINGS AND BUILDING MATERIALS—2972
CHEMISTRY AND PHOTOGRAPHY—2931, 2959, 2970
CULTIVATION OF THE SOIL, including agricultural implements and machines,—2919, 2941, 2973
ELECTRICAL APPARATUS—2916, 2951
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—2917, 2927, 2937, 2938, 2948, 2956, 2960, 2971, 2975
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—2899, 2903, 2914, 2961, 2964
FURNITURE AND APPAREL, including beneabled attention.

2964
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—2896, 2307, 2908, 2910, 2922, 2924, 2925, 2926, 2994, 2943, 2948, 2949
GENRAL MACHINERY—2897, 2911, 2918, 2921, 2928, 2939, 2946, 2952, 2956, 2957, 2965, 2971
LIGHTING, HEATING, AND VENTILATING—2898, 2935, 2944, 2962

2962
MEFALS, including apparatus for their manufacture—
2950, 2963, 2968, 2994
MISCELLANEOUS—2901, 2902, 2904, 2906, 2929, 2932, 2933, 2940, 2945, 2946, 2956, 2957, 2958, 2961
BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—2909, 2936, 2954, 2958, 2969

riages, 88 2958, 2969

SHIPS AND BOATS, including their fittings—2913, 2923 STEAM ENGINES—2911, 2983 WARFARE—2900, 2905, 2912, 2942

2895 N. JARVIE and W. MILLER, Glasgow. Manufacture of oakum, tow, &c. Dated September 19, 1868.

This consists in constructing and arranging the teasing apparatus, so that the portions of the fibrous substances will be firmly held and slowly fed forward, so as to be thoroughly acted up to the last, and so that no partially teased portions may pass through.—Patent abandoned.

2896 H. Fostes, Bermondsey. Graining and bruising leather. Dated September 19, 1868.
This consists in an endless band or belt, of a sufficient width, passing round two rollers or cylinders, mounted and revolving above a table, capable of being pressed up against

the band or belt by a treadle. One of the rollers or cylinders is mounted on an axis, carried in fixed bearings, and is driven with a slow motion, by suitable gearing, whilst the other roller or cylinder is mounted in bearings capable of adjustment, so as to keep the band or belt sluwsy distended, and revolves merely by friction with the band or belt which is driven by the first roller. That part of the band or belt which extends between the two cylinders immediately above the table, is supported above by a backing of wood, fixed to the side frames, so as to keep the band or belt perfectly flat, and prevent it from yielding to the pressure. The table which lies immediately beneath has its surface parallel to that of the backing, and is carried on a frame capable of rising and falling slightly in suitable guides.—Patent abandoned.

2897 G. SANDERS, Birmingham. Safety valves. (A com-

suitable guides.—Patent abandoned.

2897 G. SANDERS, Birmingham. Safety valves. (A communication.) Dated September 19, 1868.

This consists in the application of counteracting valves as a means for balancing safety valves. Compound valves are made use of, so arranged that one valve counteracts the other, the pressure upon each acting is contrary directions. The valves rise from their respective seats in consequence of the difference of these areas; also by the action of the escaping fluid upon an increased area of the larger valve overhanging the valve seating. The valves are weighted in order to counteract the different pressures upon them, consequent upon their different areas, by which means the required blow-off and pressures are regulated.—Patent completed. -Patent completed.

—Patent completed.

2898 J. H. JOHNSON, Lincoln's Inn. Lighting apparatus. (A communication). Dated September 19, 1868.

This relates to the construction of apparatus, whereby any number of gas jets may be ignited and extinguished simultaneously, and at any given hour, by self-acting mechanism; also to certain means for simultaneously lighting and extinguishing any desired number of gas jets, at the will of the attendant in charge of the gas main or mains. The first object is accomplished by the combined action of electricity and clockwork, whilst the second object is accomplished by the action of the pressure of gas, in overcoming, or being overcome, by the weight of a column of liquid which seals the mouth of the pipe through which the gas is supplied to the burner.—Patent completed.

2899 W. C. WOODCOCK, Owerton. Bakers' ovens. Dated

2899 W. C. WOODCOCK, Owerton. Bakers' ovens. Dated September 19, 1868.

The stove or furnace is constructed of firebrick or other refractory material set in masonry, of a square or other section, and of considerable height. This stove is provided with firebars, and a door for feeding the fuel, and an ashpit, on each side of which are air flues to admit coldair. The products of combustion and the consequent heat ascends through the rear and sides of the fireplace, communicating with the enlarged open space above, and after passing through two metal grated floors, to more equally distribute the heat, they reach the first floor of the oven (passing through the first, second, third, and fourth, or more floors contained therein), which is set on the upper part of the masonry, and enclosed on three sides and at the top, above which is the chimney, provided with a damper, standard, wheel, chain, and counterweight, to regulate the draught.—Patent completed.

2900 W. E. Lilley, Birmingham. Cartridges for breech-

regulate the draught.—Patent completed.

2900 W. E. LILLEY, Birmingham. Cartridges for breechloaders. Dated September 21, 1868.

This relates chiefly to the use of a rim-fire cap. A perforated metallic washer is inserted in the tube of the cap
on the top of the fulminate, pressure being afterwards
exorted thereon, so as to expand the washer, whereby the
closed end of the cap is enlarged. The cap is then inserted
through the aperture in a thin "base cup," the paper wad
is placed in the cup around the "rim-fire cap," and sufficient pressure employed to form the head. A second thin
"base cup" is then introduced above the paper wad, and
the turned over cartridge case placed therein. A second
paper wad is then inserted, and sufficient pressure used to
give a bevilled form to the front edge of the head.—Patent
abandoned.

abandoned.

2901 N. STEVENSON, Wimpole-street. Ornamental fountains. Dated September 21, 1868.

This consists of an open basin of crystal, carried by a hollow stem. Branches forming pipes lead from the stem to small subsidiary basins, and pipes starting from the bottom of the basins terminate in a well formed in the upper part of a closed reservoir, with the interior of which it communicates by a valve and air tube. There is a pipe running through the centre of the stem in its entire length, with its lower end entering the closed reservoir, and its upper end rising above the level of the basin. A union pipe of metal or elastic material is provided, by which the air tube is placed in communication with the pipe from a pneumatic pump or a reservoir of compressed air.—Patent completed.

completed.

2902 C. Wheeler, Speenhamland. Turning on or cutting off liquids. Dated September 21, 1868.

The patentee attaches by a flange or otherwise to the vessel containing the liquid, a bent tube or pipe; a second tube passes into a socket formed in the elbow tube, and the junction is effected by a rod or bolt passing through the two. To the second tube he attaches at right angles thereto a long tube, which must be the length of the depth of the vessel containing the liquid. The elbow tube is a fixture to the vessel, but the second tube with the long arm is free to turn therein. By depressing the latter, liquid is free to flow through the long tube, and by raising it, escape is cut off.—Patent completed.

2903 J. LORKIN, Norwood. Coffee and teapots, &c. Dated September 21, 1868.

This consists in constructing a channel, gutter, or water space around the outside of the upper portion of the coffee pot or other vessel, and in forming the lid with a depending rim, to enter or take into the channel or water space, the rim reaching nearly or quite to the bottom of the channel. The outer edge of the channel is preferably higher than the inner edge. When the channel or space is filled with cold water it not only forms a water lute or seal, to prevent the escape of steam, but also serves to condense the vapour, so that the liquid resulting from the condensation falls down into the pot, and the aroma is thus restored to the main contents of the pot.—Patent abandoned. abandoned.

2904 P. E. S. W. STOCKMANN, Keppel-street, W.C. Tents. Dated September 21, 1868.

The patentee employs instead of centre poles hollow rods or tubes of metal. Upon the lower ends of these rods

or tubes he forms screws, which he screws into suitable sockets. These sockets are formed on or connected to plates or flattened surfaces, having three or more arms or branches. These arms or branches are suitably bent downwards at their outward edges, to cause them to enter the ground to a slight extent. At or near the upper parts of the central tubular supports already described, arms or stretchers are pin jointed, or otherwise connected. These arms or stretchers are hellow, and serve to connect the central tubular supports with other tubular supports arranged on either side thereof, and when several of such side tubular supports are arranged side by side, they are connected to each other by connecting pieces, which extend from the one to the other, and these connecting pieces are also of tubular form. By these means the central tubular supports are held firmly together.—Patent completed.

2905 J. Kirk and J. Batstone, Westminster. Fixing

completed.

2905 J. KIRK and J. BATSTONE, Westminster. Fixing armour plates. Dated September 21, 1868.

This consists in attaching a lighter plate (say, about one-fourth the thickness), to the back of the armour plate, by means of eye bolts, and passing the shanks of the holding bolts through this back plate, the heads of the holding bolts being sunk into the back of the armour plate, and the shoulder of the bolt head abuting against the front of the back plate.—Patent completed.

the front of the back plate.—Patent completed.

2906 J. G. Piton, Cornhill. Bushing blocks and rollers.

Dated September 21, 1868.

This consists in constructing the sheaves of blocks and rollers with loose bushes, composed of one or more concentric rings of metal, or other suitable substance or material, a recess being formed in the sheave or roller, to receive the largest of such said rings, the other smaller rings fitting easily thereon and into each other, so that, when placed on the centre pin or axis of the sheave or roller, it moves thereon more freely than when the bush is fixed in the sheave or roller.—Patent completed.

2907 C. VERO. Atherstone. Hats. Dated September 21.

2907 C. VERO, Atherstone. Hats. Dated September 21,

2907 C. Verro, Atherstone. Hats. Dated September 21, 1868.

The first object is to produce a soft felt waterproof hat, having a fine outer surface and a coarser interior. The patentee produces in the usual way a soft felt hat of the coarser material, but thinner than usual, and he covers it with thin sheet guist-percha, or with a thin sheet of a composition softened by heat. Over the guita-percha he places a similar thin soft felt hat of finer material, and the whole is placed in a heated mould. By means of a hatter's hydraulic bag press, he presses the compound hat to the form of the mould, the heat of the mould softening the guita-percha, and causing it to stick the parts together. The inner hat or body may be made up of two or more thicknesses of felt. The second object is covering hat bodies of cork or of gossamer with felt or with woven fabrics. For this purpose, in place of causing the hat body and covering to adhere, by passing a heated from by hand in succession over every part of their surface, the body, with the covering is placed in a heated mould, and pressed together by a hatter's hydraulic bag press.—Patent completed.

2908 S. Fox, Deepcar. Umbrellas. Dated September 21,

2908 S. Fox, Deepcar. Umbrellas. Dated September 21,

1868. The object is to give to an umbrella or parasol, when open, a greater spread for a given length of rib, a greater stiffness to resist the action of the wind, and an improved droop or downward curve at the tips of the ribs. These objects are attained by giving to the ribs varying degrees of stiffness or elasticity throughout their length. For this purpose, strengthening pieces are applied to each rib, for a distance on each side of the "middle bit," which is fastened to the rib, and to which the end of the stretcher is jointed, or each rib may be thus strengthened for a distance on that side only of the middle bit which is towards its outer tip, the strengthening piece being applied to the rib close up to the middle bit.—Patent completed.

2909 F. W. Fox, Bristol. Locomotive engines and carriages

2909 F. W. Fox, Bristol. Locomotive engines and carriages

2909 F. W. Fox. Bristol. Locomotive engines and carriages Dated September 22, 1868.

The object is to dispense with the bogic trucks for railway engines and carriages. The patentee connects the contiguous ends of the framework of the engines or carriages or engine and carriages combined, by means of springs or elastic rings inserted in both or one of the frames, through which springs or elastic rings a circular bolt passes, securing the frames together in such a manner that they can freely turn laterally upon the bolt.—Patent abandoned.

abandoned.

2910 W. H. J. Grour, Commercial-road. Manufacture of tobacco pipes, &c. Dated September 22, 1868.

This consists of a table plate of equal thickness, and the required size, having projections thereon for the purpose of attaching a lever and screw of any desired length or diameter. Sides are screwed to the said table plate which have brackets of iron, steel, or brass, for supporting a horizontal spindle or shaft with a quadrant at each end; these have cogs or teeth thereon, and are made to gear into racks having cogs or teeth on one side. The racks are made to slide in grooves fixed to the said table plate, either in a vertical position or at an incline, to suit the action of the quadrants. A connecting rod is attached to the lever by means of a knuckle or circular joint, the other end of the connecting rod being connected to the quadrant spindle. The lever, being put in action, imparts a vertical motion to the screw, while the quadrant spindle receives a rotary motion at the same time.—Patent completed.

2911 W. L. Wise, Adelphi, W.C. Axie baxes, Dated

2911 W. L. Wise, Adelphi, W.C. Axle boxes. Dated eptember 22, 1868.

2911 W. L. Wise, Adelphi, W.C. Axie coxes. Dasen September 22, 1868.

This consists in a peculiar construction of axle box, in which the oil or other lubricant employed is contained in the lower part of the box itself, and is drawn up by capillary attraction through wicks to a saturated pad, which transfers it to, and ithus lubricates, the neck of the axle. The excess of oil or other lubricant, after passing on to the axle neck and falling therefrom, passes, on its return to the lower part of the box, through a filtering medium formed of canvas.—Patent abandoned.

2912 W. J. Murphy and J. B. O'Hea, Greenwich. Rifed barrets. Dated September 22, 1868.

This consists in the use of a punch or a mandril or core, having on its surface spiral projections or grooves, or both, according to the rifling desired, instead of a plain, cylindrical, or slightly conical punch, mandril, or core, wherewith to form the barrel.—Patent completed.

2913 C. E. BROOMAN, 166, Fleet-street, Registering speed vessels. (A communication). Dated September 22, 1868. This relates to registering the speed of vessels by pnear-



matic means, and consists in the employment, in combina-tion with a vane or screw, which is immersed in the water and dragged by the vessel, of an air chamber or vessel, which is alternately compressed and expanded by the revolutions of the vane or screw, and of a corresponding air chamber on board communicating by an airtight tube with the immersed air chamber.—Patent abandoned.

with the immersed air chamber.—Patent abandoned.

2914 B. C. Scott, Kingston. Measuring liquids. Dated
September 22, 1868.
This consists in so constructing measures as to dispense with the necessity of employing funnels. A spout
is affixed to the bottom and under side of the measure, a
hole being made through the bottom for that purpose;
into this hole a valve or plug fits watertight, and is connected to a vibrating lever adjusted to the top of the
measure at the handle.—Patent abandoned.

measure at the handle.—Patent abandoned.

2915 W. LEATHAM, Leeds. Preventing accidents to steam boilers. Dated September 22, 1868.

A chamber is mounted on the top of the boiler, which, near the bottom, is connected by two pipes with the interior of the boiler. These pipes are of different lengths; one of them opens into the boiler at such a level that its mouth becomes uncovered as soon as there is too little water in the boiler, while the other descends lower into the boiler. At the top of the chamber is an opening closed by avalve attached to a float within the chamber; when there is a proper quantity of water in the boiler, so that both the connecting pipes dip into the water in the boiler, the pressure steam forces water up the connecting pipes into the chamber and fills it until the float is raised so as to raise the valve. Directly, however, the water in the boiler sinks so as to leave uncovered the mouth of one of the connecting pipes, steam rises up this pipe, whilst the longer pipe acting as a syphon displaces the water from the chamber, and the float being no longer supported, falls, and so opens the valve, when steam immediately rushes through the opening, and is led by a pipe to a whistle, which it sounds.—Patent completed.

whistle, which it sounds.—Patent completed.

2916 R. Harling, Silvertown. Telegraphic instruments
Dated September 22, 1868.

This relates to improvements in telegraphic instruments on the Morse principle. Instead of the ordinary
style or pen, a rotating pen or marker is used, for printing
or embossing the paper. The pen consists of two concave
discs of steel or other metal, with tapered edges, placed
together so as to form a hollow chamber. These discs
are attached to the open end of a metal bar or thimble,
which serves as an ink reservoir. This box is made with
a hollow central stem to receive a screwed spindle, and a
clamping nut serves to retain the outer disc in place.—
Patent completed. Patent completed.

Patent completed.

2917 T. Lucas, Bury, and W. Grimshaw, Ashton.

Preparation of wool for letting. Dated September 23, 1868.

An ordinary carding engine is made use of, for the purpose of placing the fibres of the wool with their length in the same, or nearly the same, direction. As the wool leaves the doffer, it is received on a table, placed upon a reciprocating carriage, which traverses the desired length of a sheet, and when any required number of folds have been placed on the table, the doffer is stopped, and the wool passing from the doffer is cut to the desired length, and now lies on the table, which is moved on a pivot through any desired angle.—Patent abandoned.

2918 F. O. CALVERT, Manchester. Dyeing and printing Dated September 23, 1868.

This consists in the use of phosphoric acid, combined with various bases, such as lime, magnesia, and others, either with or without tanning substances, as mordants for dyeing and printing. The bleached or scoured yarns or fabrics are passed into a weak solution of one of the phosphates above described, previously dissolved in an acid, and then into a bath containing a vegetable, animal or coal tar dye.—Patent abandoned.

2919 E. H. PRENTICE, Stowmarket. Treating sewage
Dated September 23, 1868.
This consists in the addition of phosphoric acid, or
compounds thereof, known as superphosphates, or any
soluble salt of phosphoric acid, to the sewage matter or
other water to be acted upon, in the proportion of about
from 121b. to 151b. to 1,000 gallons of sewage, and in the
precipitation of such phosphoric acid or soluble phosphates,
by the addition of lime or any other earthy or alkaline
base, in the proportion of sowage.—Patent abandoned.

2920 J. MACKINTOSH and W. BOGGETT. Applying band.

2920 J. MACKINTOSH and W. BOGGETT. Applying bands to boots, &c. Dated September 23, 1868.

This relates to a patent, dated March 28, 1868, (No. 1065) and consists in the application of the same kind of fillets, thou described, to other parts of boots and shoes, as well as the fronts. A vertical cut is made down each side of the boot to the depth of about 5in., and four of five illets are introduced transversely across the opening between the leather and the lining.—Patent abandoned.

the leather and the lining.—Patent abandoned.

2921 E. W. HALLIDAY, Hammersmith. Lubricating machinery. Dated September 23, 1868.

A disc or plate, working between two fixed plates, is employed. A hole or holes are formed in the movable disc or plate, which alternately come opposite a hole or holes in one of the fixed plates, and then opposite a hole or holes in the other fixed plate; one of such fixed plates forms the bottom of the oil or grease cup, whilst the other is held in position by bolts and nuts, and is kept up to the movable plate or disc by means of a spring or springs or other means. The movable disc or plate is fixed to and operated by a rod or shaft, to which motion is given from any suitable part of the machine or engine.—Patent completed. 2922 H. LOMAX, Over Darwen. Sewing machines. Dated September 23, 1868. This consists in an increase.

September 23, 1868.
This consists in an improved construction of those parts of the sewing machine which press and move the material operated by means of what is usually termed a presser foot. A presser foot of novel and improved construction is employed, which consists of two parts, an outer frame, and an inner foot that presses and moves the material.—Patent completed.

2023 H. J. B. KENDALL, Great Winchester-street, E.C. reservative paint for ship's bottoms. Dated September 29

The composition consists of the following ingredients:

The composition consists of the following ingredients:

Arsenate of copper, exide of iron, carbonate of lime, crystallized strychnine, concentrated anhydrous extract of tobacco, crystallized borax. To these ingredients coal tar is added, and the whole is ground.—Patent abandoned.

2024 A. BARCLAY, Kilmarnock. Barometers and thermometers, and their combination with watches. Dated Sep-

2024 A. BARCLAY, Kilmarnock. Barometers and thermometers, and their combination with watches. Dated September 23, 1868.

The construction of barometer which it is preferred to employ consists of a thin hollow tube, of a section somewhat elliptical or flat. This tube is exhausted and fixed at one end to the case or framing of the instrument, whilst the other end is free and attached by a link to a lever, movable about a centre, and which at its opposite end carries a toothed rack, gearing into a pinlon, on the axis of which the indicating needle is fixed. The link is to be made of a more expansive metal than the tube, so as to counteract the expansion of the tube by heat. The barometer tube is placed in the case of the combined instrument so as to eneircle or surround the mechanism of the watch. The thermometer consists of a metallic tube, with or without a bulb at one end, filled with mercury or other liquid, which in its expansion or contraction causes the movement of alever, to which it is connected by a link in such a manner that the movements in the tube are communicated to it, and thence by means of a rack fixed at one end of the lever, which actuates a pinion carrying the indicating arm. The indicating arm is provided with a pencil, the point of which bears against a graduated sheet of paper, which is maintained travelling at an uniform and known rate, so that as the variations in temperature cause movements of the needle, the pencil point varies in position accordingly, and these variations are depicted upon the graduated travelling web or sheet of paper.—Patent completed.

2025 A. BOOTH and J. HARRISON, Stalybridge. Secing

paper.—Patent completed.

2925 A. Booth and J. Harrison, Stalybridge. Secing machine. Dated September 23, 1868.

This relates, first, to supplying the under thread in greater quantity than has hitherto been practicable, and consists in substituting a reel or bobbin, carrying the under thread in place of the shuttles or spools, such reel or bobbin being disposed in a cylindrical box or cavity, formed in the table or arm of the machine, parallel with the vertical needle bar, and placed upon a stationary circular at the bottom of the box or cavity. Second, to a novel feed motion, which is arranged to work in any direction, and consists of a sleeve surrounding a cylindrical bar, through which the needle bar reciprocates. Third, to a novel description of tension for the threads, which consists in applying the pressure of a three-legged spring to a seleve, upon which the bobbin is fixed.—Patent abandoned.

abandoned.

2926 J. H. GLEW, City-road. Button holes. Dated September 23, 1868.

This relates to a patent, dated January 10, 1868 (No. 93), and consists in inserting between the leathers or other substances of which the said boots shoes, gaiters, or other articles are constructed, pieces of vulcanized indiarubber, or other suitable material, having slits or holes therein, the slits or holes being placed over corresponding holes in the leathers. Both surfaces of the leather or other material, and also the india-rubber itself, may be conted with any suitable adhesive composition, so that the surfaces may adhere firmly one to another, or the two leathers may be also stitched together.—Patent completed.

pleted.

2927 C. Heptonstall, Kirkburton. Looms. Dated September 23, 1868.

This relates to the letting-off and taking-up motions or self-acting means of letting-off or delivering the warp, and of taking up or carrying forward the fabric as woven. A series of short beams or bobbins are employed, for holding and supplying the warp in sections; these are mounted in suitable framework, placed at the back of the loom in the usual manner. On each of these beams or bobbins a ratchet wheel is formed, to which is applied a catch lever hinged to the framework. The warp passes from these bobbins over one or more rails and the back beam, thence through the healds and the reed to the taking-up apparatus, in the usual manner, to each section of warp threads. Betwirt the rails a pendent tension weight of suitable size or weight, according to the amount of tension required, is suspended, or springs may be used. These weights are connected by cords or a chain to the catch levers so that as any one of the weights is raised by the taking-up motion, it lifts the catch lever out of the teeth of the ratchet wheel with which it is in connection, and thereby leaves the bobbin at liberty to turn on its axis, and let off warp: and as the weight lowers the catch lever, again takes into the ratchet and stops the rotation thereof, and consequently the let-off. The invention relates also to the taking-up motion in looms for weaving corsets, or other woven fabrics, and consists, first, in the application of worms and wheels, with a new combination of levers and ratchets for driving the grooved or fluted taking-up rollers. And, second, in the application of a toothed lever, to fit into and form a nip or hold on one of the fluted rollers, and tone an inpor hold on one of the fluted rollers, and thereby to employ only one series of such rollers instead of two series.—Patent completed.

such rollers instead of two series.—Patent completed.

2928 W. Thomas, Carnarvon. Circular saus. Dated September 23, 1868.

The saws are formed of a number of triangularly or other suitably-shaped segments, each segment forming a separate and independent tooth. These teeth or segments are retained or held between two circular discs or plates, in one of which a number of pins or dowels are securely fixed, two or more to each tooth; the pins projecting through the several teeth enter holes formed in the second disc. The two plates, with the segments between them, forming a saw, are placed upon an ordinary saw spindle, and screwed up firmly between washers.—Patent completed.

spinate, and screwed up irmiy between washers.—Patent completed.

2929 A. M. Weiri and M. A. Weiri, Bayswater. Previously Sympaling. Dated September 24, 1868.

This consists, first, in certain improvements in the valve boxes, valves, or taps employed for opening and closing communication between the tubes and compressing air vessel, or between them and the external atmosphere. Second, in employing in connection with the compressing instrument, a self-acting relief valve, for the purpose of maintaining the pressure of the air contained therein in equilibrium with that of the external atmosphere when signals are not being sent. Third, in an improved arrangement of the sending mechanism, whereby one movement of the handle or key is made to operate upon both the valve and air chamber at the same time. Fourth, in the arrangement and adaptation of mechanism, in connection with compressing or exhausting instruments, whereby the patentees are enabled to transmit motion to hammers or other instruments for ringing bells, discharging guns, exhibiting semaphore and other signals.—Patent completed.

2930 H. WOODS, Salford. Heating water. Dated Septem-

2930 H. Woods, Saltord. Heating water. Dated September 23, 1868.

The water to be heated is contained in a tank or cistern, made of wood or metal, or other material, and of sny suitable dimensions. The tank is fitted with one or more sets of steam chests or main pipes, which are thred in the interior of the said tank, and at a short distance above the bottom thereof, or are formed upon the bottom of the said tank, each of the said chests being connected to a corresponding chest by means of a number of bent tubes, each of which is attached by one end to one of the chests, and by the other end to the other end of the chests. The tubes penetrate into the body of water in the tank to a suitable distance in a vertical or other suitable direction, in order that the steam, when passing from one chest to the other, through the said tubes, may impart heat to the water. The steam eners one of the chests, and passes through the tubes to the other chest.—Patent completed.

2031 C. HENGST, H. COATSON, J. B. MUSCHAMP, and N.

chest.—Patent completed.

2931 C. HENGST, H. COATSON, J. B. MUSCHAMP, and N. WILSON, Holborn. Manufacture of carburetted hydrogen. Dated September 24, 1863.

This consisis in producing carburetted hydrogen or luminous gas, from the volatilization of hydrocarbonaceous fluids, known under the name of dead oils, gas tars, petroleum, vegetable tar, common fat, or oelic acid, in any form. In the process of volatilization, the hydrocarbona or dead oils are taken and placed in a receiver or tank, so as to obtain the necessary head or fall, to insure their flowing freely into the retort, and there combining with superheated steam. The heat of the superheated steam volatilizes the hydrocarbon in the retort, and it passes off through the exit pipe on its way to the gas holder. Intervening between the gasholder and the retort, is a condenser of any known form.—Patent completed.

denser of any known form.—Patent completed.

2932 W. Dunn, Newington-green. Substitute for the soldering of pipes. Dated September 24, 1868.

The object is to dispense with soldering in the connecting of cocks, unions, flanges, or Ts, to metal or other pipes. At the end of one pipe, a boss of any suitable metal, and of any desired shape applicable to the purpose, is affixed. This boss is provided on its exterior with a screw thread, and has under it a projecting nose at the fore end. A nut is then taken and tapped with a thread of the pipe to be connected, which is bulged.—Patent completed.

2933 E. Death and J. Ell.wood, Leicester. Pumping apparatus. Dated September 24, 1868.

A spur wheel fixed on the main vertical shaft is made

to gear with a pinion suitably mounted. On this pinion a flange or disc crank connected by a pin to the piston reds of the pumps is formed. The pin traverses in a slot link between and forms part of the two piston rods.—Patent abandoned. abandoned.

abandoned.

2934 E. DEATH and J. ELLWOOD, Leicester. Culting leather, Ac. Dated September 24, 1868.

Its object is the substitution of a continuously revolving roller, with knives or cutters on its periphery, for the ordinary vertical reciprocating apparatus, and consists in the use of a roller with a series of suitably formed knives or cutters, fixed on the periphery of the roller at the requisite distances apart. This roller is caused to revolve in contact with and press against another roller covered with wood, lead, or other suitable substance, that will not injure the cutting edges of the knives or cutters on the said knife rollers.—Patent completed.

2935 D. Cowan, Long-acre. Float values for cistors.

Dated September 24, 1868.

The float valve is constructed of two parts, a float which is an airtight vessel, circular in shape, with a domeshaped cover, and having a central opening up to the cover, large enough to pass over the valve, and a valve of an egg shape with a central spindle, upon which is a button or chack to close upon the valve seat. This button rests in a cup underneath, through which the spindle moves freely in a vertical position.—Patent abandoned.

2936 J. FRY, Marylebone. Wheels. Dated September 24,

1868. This object is to make a wheel, one of the spokes of which can be readily removed and replaced. A circular metal box and nave is cast in two parts with projecting lugs, placed at equal distances on the outer edge of their circumference; the lugs correspond in number with the spokes to be used in making the wheel.—Patent completed.

2937 C. Callow, Burnby. Looms. Dated September 24

1868.

This relates to improved mechanism for "letting off" the warp, as described in the specification of patent No. 2708, 1855. Near one or both ends of the vibrator a loose boss, having three arms thereon, is placed. To the outer arm a link and weight are attached, and to the inner arm is attached, by a screwed or chased rod and nob, a chain, which is passed round the neck of the warp beam to a stud fixed to the framing of the loom. The centre or third arm is operated upon by the upper rod of the vibrator,—Patent abandoned,

third arm is operated upon by the upper rod of the vibrator.—Patent abandoned,

2038 J. F. WARNER, Charles-street, W. Embroidering fabrics. Dated September 24, 1868.

First, there is a rotating bobbin holder, capable of containing an indefinite number of bobbins, and having in the centre a hollow tube or spindle for receiving the threads and geared in relation to the erothet hook or needle, in such a manner that the latter is encircled by the thread, which passes before it, during the movement of the bobbin holder. Second, a system of vertical rock levers, operated by cams, employed in distributing the threads which are to be applied in the form of a chain stitch to the fabric. Third, several crotchet hooks, and one, two, or more vertical thread guides, and a fixed bobbin holder. Fourth, a combination with the preceding mechanism of vertical rocking thread guides, for distributing thread or wool, so as to form the embroidery. Fifth, an arrangement of mechanism for connecting and disconnecting the vertical thread guides with the actuating mechanism. Sixth, a cam of special form, for operating the thread guides, which form a crossed point or stitch. Seventh, a large rotating table, on which may be piaced objects of considerable bulk, which may be manouvred with facility. Fighth, a substitution of hand power for pedal power by the treadle.—Patent completed.

2039 W. T. WATTS and D. F. Fleetwood. Hydraulic.

2989 W. T. WATTS and D. F. FLEETWOOD. Hydraulic. This refers to a patent, dated August 28, 1867. Upon a



main shaft are fixed cams, governing the forcer and like wise the pressure plate. The action of these cams is reciprocating, and by a ratchet motion or other mechanism, the forcer may be caused to advance any desired distance at each revolution of the cam shaft, whilst by the alternating force of the pressure plate cams are intermittent, and pulsative action is given to the pressure plate; or the same result is obtained by interposing hydraulic cylinders between the forcer and pressure plate cams, or either of them, and the die or mould, thus enabling the patentees to regulate, by means of suitable valves, the pressure generated by the action of the cams.—Patent completed.

2940 J. Boggs, Holborn. Making white lead. Dated Sep. tember 25, 1868

tempor 20, 1868.
Where cast blue lead is employed for making white lead, the patentee casts the metallic lead upon very hot plates, and makes the white lead in pots. In effecting corrosion, he uses nitric, nitrous, and acetic acids.—Patent abandoned.

2941 J. TORBITT, Belfast. Treatment of the potato. Dated

2941 J. TORBITT, Belfast. Treatment of the potato. Dated September 25, 1868.

This consists in digesting the washed tuber in water, at a temperature below the gelatinizing point of starch, but sufficiently elevated and continued for a sufficient length of time to soften and render flexible its fibrous structure, so as to permit of the separation of its liquid from its solid constituents, by mechanical pressure.—Patent completed.

constituents, by mechanical pressure.—Patent completed.

2942 C. E. Brooman, 166, Fleet-street. Breech-loaders.
(A communication.) Dated September 25, 1868.

This consists in closing the breech by means of a vertical sliding block worked by the trigger guard, which in the same movement cocks the gun, raises the sliding block, to allow of the insertion of a cartridge, and acts on an extractor. The sliding block has an opening at the lower part, while its upper part is solld, and carries the exploding pin. A transverse pin in the lower part of the block takes into a slot in a plate at the front end of the trigger guard. The guard is pivoted on the hammer pin, and a spring catch secures it when in place. The extractor is a vertical piece, pivoted near its centre, and its lower end has a tail-piece or back projection; a spring presses the tail back, and keeps the upper end or extractor proper in position. The tang has projections, to enter corresponding holes in the breech end of the barrel, and is recessed at the top to guide the cartridge.—Patent completed.

2943 J. L. R. Steckel, Ottawa, Canada. Musical instru-

2943 J. L. R. STECKEL, Ottawa, Canada. Musical instru-rments. Dated September 25, 1868.

This consists in substituting for the circular and com-paratively small holes or openings now in use in wind instruments, openings of an oblong form, and of much lurger area relatively to the size of the tube than is ordi-nary, and increasing gradually in size from the foot of the instrument to the embouchure.—Patent abandoned.

2944 J. WRIGHT and W. H. WILLIAMS, Birmingham.

Gas burners. Dated September 25, 1868.

This relates to fish-tail burners. Instead of forming them solid and drilled out on the interior, the patentees form them of a tube, cast or otherwise produced, and apply a metal tip within the top of the tube, in such a manner that the said tip may be removed for the purpose of renewal, when or as often as required.—Patent completed.

2945 P. KEAN, Glasgow. Dyeing. Dated September 25,

1868.

The dye stuff is placed in a tank or cistern, which is divided into any suitable number of water-tight compartments. The different dyes may be arranged separately in the compartments. The fabrics are carried upon a beam or roller placed at or near one end of the cistern or tank, and are led through the different compartments of the cistern in which the different dyes are placed, by means of sinking and press rollers.—Patent abandoned.

2946 C. SCRIVEN and W. HOLDSWORTH. Planing, boring,

2946 C. SCRIVEN and W. HOLDSWORTH. Planing, boring, and slotting. Dated September 25, 1868.

The tool holder traverses the cross slide by means of screws or other appliances; it is self-acting and adjustable to any length of stroke within the range of the machine. The body to be operated upon is fixed on the table or bed plate of the machine, which is self-acting, longitudinally, as an ordinary planing machine, and can be so used.—

Patent abandoned.

2947 W. E. Newton, Chancery-lane. Adhesive stamps.
(A communication.) Dated September 25, 1868.

This relates to a method of cancelling stamps. The stamps are made with a hole or holes through the body, and are covered or backed with tissue or other thin bibulous paper, coated with mucilage or other adhesive substance. On applying the mucilage, a certain portion of such backing is insulated within the area of the holes.

—Patent abandoned.

or such backing is insulated within the area of the holes.—Patent abandoned.

2948 G. RITCHIR, Hounslow. Sunproof fabrics and tents.
Dated September 25, 1868.

In the construction of waterproof and sunproof fabrics, the patentee takes two sheets of woven cotton or other fabric, and thoroughly cleanses and removes all grease from them, by sosking or boiling them in alkaline solution. The fabrics are afterwards thoroughly rinsed and dried, and cork dust, mixed with waterproof and elastic gum or india-rubber cement, is then spread upon one or both fabrics by a spreading machine. The coated surfaces of the fabrics are then placed together, and these two fabrics are passed between two rollers, by which the mingled cork dust and cement is squeezed, not only into the interstices of the fabrics, but also through the fabrics, to form an external coating to them. The fabrics being thus united inseparably together, and three interstices filled in with cork dust and cement, their outer surfaces are made flat and smooth by other rollers, and may then be painted, if required. By these means a fabric, suitable for being used as a covering for tents, is obtained.—Patent completed.

2949 W. J. LEDWARD, Middlesborough. Mechanical

2949 W. J. LEDWARD, Middlesson, mekkepers, Dated September 25, 1868. LEDWARD, Middlesborough. Mechanical

timekrepers.

timekeepers. Dated September 25, 1868.

The object is to record the time when workmen come to work. A till is employed to receive the tailies of the workmen. These tailies are dropped through the slit or mouth of the till into a series of drawers or boxes ranged vertically one above the other. Each of the drawers or boxes, with the exception of the lowest one, is carried on slidees or guides so that it can be instantaneously slid forward, and so brought under the end of the mouth or shoot of the till. The upper drawers or boxes are all first drawn

back and retained from covering over the lowest box of drawer, and any tallies dropped through the slit or mout of the till drop into the lowest box.—Patent abandoned.

THE

of the till drop into the lowest box.—Patent abandoned.

2950 R. ACLAND and J. HOCKING, Plymouth. Calcining ores. Dated September 25, 1863.

This consists in calcining ores, such as tin and copper, containing sulphur, arsenic, or other foreign substances, by exposing them to heat in contact with heated air by passing through a revolving tube or cylinder kept in constant steady motion, regulated in speed so as to keep them under the influence of heat a greater or less length of time, varying according to the constitution of the ores. The tube is constructed of either wrought or east iron lined with firebrick about 30ft. long, and 4ft. in diameter. On the exterior of the tube are three or more cast iron rings, which work on friction rollers, by which the tube is supported. The rotary motion is imparted by an endless screw working into a cogged ring. The ore is supplied in a regular steady stream at the end farthest from the fire, and by the revolving of the tube, which is elevated at one end.—Patent completed.

2951 E. Prevost, Notting-hill. Electro-magnets. Dated

2951 E. PREVOST, Notting-hill. Electro-magnets. Dated

2951 E. Prevost, Notting-hill, Electro-magnets, Dated September 25, 1868.

A bar of iron of the best quality is forged into a horse-shoe form, and immersed in a bath of molten lead, and allowed to cool slowly. This operation is repeated seven times; during the last, flowers of sulphur are added. The bar is then plunged in a bath of alcohol, at a high temperature, until the metal assumes a yollowish green colour, when sal ammoniac is added. When cooled, the bars possess great electrical power.—Pstent abandoned.

2952 P. J. E. CARON, Paris, Provining the breaking of

possess great electrical power.—Patent abandoned.
2952 P. J. E. Caron, Paris. Preenting the breakage of ropes in hoisting gear. Dated September 26, 1868.
This consists of a pulley turning on an axis in a casticno block, to which are connected the various parts of the machine. The block is provided with two arms, rising on each side of the pulley, and connected at their upper part. These arms form an integral part of the block, and may be cast therewith; they are further provided with lugs, carrying the small axes of the jaws. The jaws are moulded on the outside to the form of the chain, and are provided, at their lower parts with hooks to which are attached springs, whose outer ends are connected to the blocks at the lower parts of arms. Lovers of peculiar form are fixed to the upper part of the movable jaws, which levers are provided with friction rollers at their forked ends embracing the chain.—Patent completed.
2953 H. Daver, Victoria Chambers. Steam engines and

2953 H. DAVRY, Victoria Chambers. Steam engines and

2953 H. DAVEY, Victoria Chambers. Steam engines and pumps. Dated September 26, 1868.
This consists, first, in an improved means by which the admission and emission valves of steam engines are actuated so that the governor is made to vary the points in the stroke of the engine at which the supply steam is cut off with the varying resistances which the engine has to overcome. Second, in an improved means by which the piston of direct-acting steam engines is controlled, so that the engine is made to work smoothly, and is particularly applicable to steam pumps. Third, in means by which steam valves of direct-acting pumping engines are actuated.—Patent completed.

steam valves of direct-acting pumping engines are actuated.—Patent completed.

2954 J. H. JOHNSON, Lincoln's Inn. Permanent way.
(A communication.) Dated September 26, 1868.

This relates, first, to a method of securing the ordinary double-headed rails in chairs, whereby the usual wooden key is dispensed with. And, second, to a mode of constructing an iron permanent way which shall be as nearly as possible uniformly elastic. The chair may be secured in any convenient manner on to a wooden or other sleeper. An iron or steel wedge, which may be curved or bent, is driven underneath and at right angles or transversely to the rail, suitable openings being made in the lower part of the jaws of the chair for the purpose. By this means the rail is forced upwards, and jaumed tightly against a filling-piece which is inserted between one side of the rail and the jaw of the chair. In the second part of the invention, the chairs may hold the rails either in the ordinary manner, or they may be shaped and made so as to hold the rails in the manner first described.—Patent completed.

2955 J. SUTCLIFFE, Levenshulme. Warping mills and

2955 J. SUTCLIFFE, Levenshulme. Warping mills and

2955 J. SUTCLIFFR, Levenshulme. Warping mills and hecks. Dated September 26, 1863.

The object is, in the first place, to make the warping heck last double or treble or any number of times longer than hecks as hitherto made. Instead of putting only one hole on each shank, as hitherto, the patentee puts two, three, or any number of holes for the eyes on one shank, so that, when one hole is cut, the warpier can use another, and so on, until he has used all the holes. The object is, second, to make the warping hecks cheaper. Instead of brass racks and forged eyes, the patentee makes the hecks of flat rods of steel or fron by laying two rods of flat iron or steel side by side instead of the brass racks, and riveting or screwing short pieces of flat iron or steel to them, and putting two, three, or any number of holes in the flat iron or steel to form the eyes. The improvements in warping mills consist in arranging the driving shaft along the top or bottom of the mill at right angles to the mill, and using either wheels or friction pulleys for driving the mill. By this arrangement, the mill has not so many wearing parts, and, consequently, less oll will be used.—Patent completed.

2956 J. Rambottom, Crewe. Communicating in railway

Patent completed.

2956 J. RAMBOTTOM, Crewe. Communicating in railway trains. Dated September 26, 1868.

A slender cord is kept in a state of tension, and extending from the engine or tender at the front of the train along the sides of the carriages to the guard's van at the rear. This cord is supported in brackets fixed to the carriages at an uniform height and lateral distance from the rail, thus allowing the use of open loops to support the cord which is placed in any convenient position within reach of the passengers, but, by preference, a little below the windows or right hand side of the train. One end of the cord is attached to a gong, whistle, or other alarum at the front of the train, and the other end may be attached to a grooved pulley or reel in the guard's van attached to an alarum.—Patent abandoned.

2957 J. HEAL, Ashter-under-Lyne. System of gearing.

2957 J. HEAP, Ashtor-under-Lyne. System of gearing.

29.77 J. Heap. Ashtor-under-Lyne. System of gearing. Dated September 26, 1868.

This is applicable to lathes and also to other machines. The wheel or drum or speed pulley is made hollow, and runs loose on the shaft spindle or axis to which the slow motion is to be communicated. In the interior of this wheel drum or speed pulley is placed an internal toothed spur wheel, which is keyed on to the shaft spindle or axis to which the slow motion is to be communicated. Into this internal toothed spur wheel is geared an exterior

toothed spur wheel, which last has one, two, or more teeth less in its circumference than the internal toothed spur wheel.—Patent abandoned.

wheel.—Patent abandoned.

2958 C. F. Whitworth, G. Pearson, and W. Smith, Manchester. Safety apparatus for railroad inclines. Dated September 26, 1868.

Two main levers are employed parallel to one of the rails, and nearly close to it, so that the flanges of the wheels of the waggons or carriages can act upon them, the normal position of each lever being such as to present an upper surface inclined from near the bottom of the rail under which its axis is fixed to the top of the rail, near the level of which it terminates with a short curve downwards.—Patent abandoned. Patent abandoned.

of which it terminates with a short curve downwards.—Patent abandoned.

2959 P. Spence Manchester. Manufacture of copperus. Dated September 28, 1868.

Iron ores, containing a large amount of protoxide of iron are taken, preferably containing not less than 25 to 30 per cent. of iron, in the state of protoxide. These ores and slags are ground to powder, and the powder is line enough when passed through a sieve of twenty meshes to the lineal inch. Say, 2001b. of this powder are now taken, and having ascertained its proportion of iron in the state of protoxide, the quantity of acid required to combine with all the iron contained is calculated. The powder is put into a shallow basin in the floor of the house, and when the acid to be used is sulphuric acid of the ordinary chamber strength, then, before adding the acid, an ordinary bucket full of water is mixed with the powder in the basin. If the ore contains from 50 to 55 per cent. of iron in the state of protoxide, an equal weight of the acid is now added. In a few minutes, the mixture heats and becomes semi-liquid, then boils, and almost instantly becomes a pasty mass. It is then thrown out, and when cool becomes perfectly dry.—Patent completed.

and when cool becomes perfectly dry.—Patent completed. 2960 J. Petrie, jun., Rochdale. Washing wool, &c Dated September 26, 1868.

This relates, first, to those racks of washing machines which are caused to move to and fro in the fluid, while they vibrate upon a centre of motion, which are commonly called swing rakes, and consists in an arrangement whereby they become balanced. Second, to a method of mounting the rakes by the use of a parallel motion. Third, in a method of effecting a variation in the sweep of swing rakes. Fourth, in a method of delivering the material to the squeezing roller. And, fifth, to a method of constructing chains for travelling surfaces used in washing machines.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT

Dated March 30, 1869.

Dated March 30, 1869.

946 G. T. Bousfield, Loughborough Park, Brixton,
Surrey. Improvements in sewing machines.

947 C. Weckes, Great George-street, Westminster.
Improvements in the combustion of wood and other fuel,
particularly applicable to firewood.

948 J. Bath, King William-street, City. Improvements
in the construction of sliding or telescopic pencil cases,
adanted also for pens.

in the construction of sliding or telescopic pencil cases, adapted also for pens.

949 H. G. Dixon, Murraygate, Dundee. Improvements in the breaks and seats of velocipedes and apparatus connected therewith.

950 W. W. Harris, St. John's Wood. Improvements in velocipedes.

951 A. Muir, Victoria Bridge Works, Manchester. Improvements in velocipedes.

951 A. Muir, victoria brings works, manuscreat. Improvements in velocipedes.

952 M. M·Leod, Edinburgh. Improvements in railways, and in the mode of working the same.

953 C. E. Brooman, Flect-street, City, patent agent. Improved means of balling or winding threads, and apparatus employed therein, the apparatus being applicable to other purposes.

954 A. Barclay, Kilmarnock, Ayrshire. Improvements in the believe of generators.

954 A. Barclay, Kilmarnock, Ayrshire. Improvements in steam bollers or generators.
955-J. Briggs and J. Almond, Blackburn. Improvements in looms for weaving.
956 T. E. Williams, Newport, Monmouthshire. An improved method of, and apparatus for, distilling hydrocarbon oils.
957 W. F. Prototr, Cheapside, City. An improved construction of sewing machine table.
958 F. Render, Manchester. Improvements in railways.
959 T. G. Webb, Manchester. Improvements in furnaces for the manufacture of glass, commonly called melting furnaces, and in the manufacture of melting pots for the same.

metting turnaces, and L. for the same.

960 H. Y. D. Scott, Ealing, Middlesex. Improvements in lime and other kilns.

961 W. E. Cadman, Holloway, Middlesex. Improvements in decorating surfaces.

Dated March 31, 1869.

962 A. Chambers, Fairfield-road, Bow, Middlesex. Improvements in carriages, vehicles, or conveyances propelled or moved by manual power, parts of which improvements are applicable also to other purposes.

963 B. Dobson and J. Eastham, Bolton. Certain improvements in carding engines.

964 F. W. Follows and J. Bate, Manchester. Certain improvements in lawn mowing machines.

965 T. A. Dillon, Dublin. Improved methods of, and apparatus for, utilizing the waste steam of locomotive engines.

engines.
966 T. Greenwood, Leeds, and J. Keats, Leek, Stafford-

966 T. Greenwood, Leeds, and J. Nears, Lees, Commonshire. Improvements in the manufacture of boots and shoes, and in machinery to be used in such manufacture.

967 A. F. Reird, Pimico. Improvements in earth closets and urinals.

968 R. Johnson, Waterloo-place, Pall Mall. Improvements in the construction of continuous bar or strained wire fonces.

ments in the construction of continuous bar or strained wire fences.

969 G. Wells, Westminster. Improvements in separating copper and bismuth from ores containing metals, either separately or combined with other metals.

970 J. H. Lloyd, Llangetin, Anglesey, North Wales. Improved machinery for working, cutting, shaping, sawing, and hammering tools by power, and for apparatus connected therewith.

971 H. Davey, John-street, Adelphl, Middlesex. Improvements in hydraulic machinery, and in means of actuating ithe same, part of which is applicable to steam engines.



972 W. Langer, Whitechapel-road, Middlesex. A new and improved method of, and apparatus or appliances for, the manufacture of cigars.
973 R. J. B. Mills, Southampton-buildings, Middlesex. Improvements in envelopes.
974 T. Corbett, Shrewsbury, Salop. Improvements in carts, waggons, and drays.
975 B, and H. Craven, Hazlehead, near Sheffield, and J. N. Craven, Highthorne House, near York. An improved brick and tile pressing machine.
976 J. Livesey, Victoria Ckambers, Westminster. Improvements in the permanent way of railways.
977 J. A. and J. Hopkinson, Huddersfield. Improvements in direct-acting steam engine indicators.
978 R. Jones, Botolph-lane, City. Improvements in the preservation of animal and vegetable substances to be used as food.

preservation and assessment as food.

979 W. E. Gedge, Wellington-street, Strand. A novel method of fastening belts or bands by means of buckles termed belt buckles, with shifting wedges.

980 J. B. Gridley, Ingram-court, Fenchurch-street, City.

980 J. D. Grundy, angular of the control of the con Improve

ments in engraving and chasing articles of metal.

Dated April 1, 1869.

982 J. C. Lee, Ashton-on-Mersey, Chester. Certain methods of collecting exercts and the products of combustion ordinarily emitted by chimneys, and of treating the same in order to render them comparatively innocuous, and to obtain useful products therefrom.

983 C. Lange, Strand. Improvements relating to the winding mechanism of watches and clocks.

984 H. Carter and G. H. Edwards, Bow, M ddlesex. Improvements in a breech-loading firearms known as Chassepot rifles.

985 G. Holcroft and W. N. Dack, Manchester. Improvements in, and applicable to, steam engines.

986 J. Beckett and A. W. Field, Llandudno, Carnarvonshire. An improved self-acting brake for railway carriages.

riages. 87 E. O'Connell, Greenwich, Kent. Improvements in paratus for supplying nourishment to infants, invalids,

and others.

988 J. B. Bowcliffe, Manchester. Improvements in the
manufacture of wire cloth for paper making machines.

989 C. D. Norton, Old Street-road, E.C. A new and
improved method of making revolving boot and shoe heels
and tips.

990 T. Higgins, Warrington-gardens, Maida-hill, Middleare Improvements in hets.

990 T. Higgins, warringon-gauce, and a sex. Improvements in lats.
991 J. Caplin, Pentonville-road, Middlesex. Improvements in certain parts of umbrellas and parasols.
992 W. Gibson, Birmingham. Improvements in cramp keys or implements for taking to pieces, putting together, and lubricating breech-loading firearms, and for other like uses.

and lubricating breech-loading nrearms, and for obtain like uses.

93 G. H. Wilson and G. E. Pullen, Commercial-road, Middlesex. Improvements in apparatus for securing or fastening window sashes, and an improved bolt, applicable to sash fasteners of all kinds.

934 W. Allan, Sunderland. Improvements in marine steam engines.

935 W. Bayne and O. E. M'Gregor, Wolverhampton. Improvements in carpenters and joiners' planes.

Dated April 2, 1869.

996 G. H. Smith, Colchester, Essex. Improved means and apparatus for indicating when eggs, vegetables, and other substances are sufficiently cooked or heated.

997 J. Bath, King William-street, City. An improved printing and copying or repeating letter press or machine.

998 H. A. Fletcher, Lowes Engine Works, near Whitehaven. Improvements in steam generators.

998 H. A. Fletcher, Lowca Engine Works, near White-haven. Improvements in steam generators. 999 W. Marston, Loughborough, Leicestershire. Im-provements in bolts. 1000 F. Schafer, Piccadilly. Improvements in covers for vessels, and an improved clip for bottles placed in such

vessels.

1001 J. (Cruttenden and T. Wells, Maidstone, Kent. Improved arrangements of mechanism for facilitating voting by ballot, and in the construction of parts of the apparatus in connection therewith.

1002 W. Y. Craig, Harceastle Collieries, Stoke-upon-Trent, and S. P. Bidder, jun, Hillfield House, Mitcham, Surrey. Improvements in safety lamps, and apparatus employed in connection therewith.

1003 D. Osborn, Great Berkhampstead, Hertfordshire. Improvements in apparatus to be employed in concrete building.

building.

1004 S. K. Hoxsie, Philadelphia, Pennsylvania, U.S. A.
Improvements in coal and grain boat elevators.

Improvements in coal and grain boat elevators.

Dated April 3, 1869.

1005 G. H. Ellis, New Barnet, Hertfordshire. Improvements in apparatus for cleaning boots and shoes, knives, &c., applicable also to hair brushing purposes.

1006 M. Wolfsky, Pligrim-street, Ludgate-hill, City. Improvements in locks and fastenings for bags, satchels, boxes, and other like articles.

1007 R. Allan, Kelvindale, Lanarkshire. Improvements in machinery for the manufacture of paper.

1008 D. Nicoll. Caledonian-road, Middlesex. An improved safe for food, and automatic apparatus for generating preservative and other elastic gases to be used in connection therewith, and for other domestic and general purposes.

ourposes.

1009 E. Wilson, Peckham, Surrey. Improvements in electiopedes, parts of which improvements relate to a stochet and treadle motion applicable to various machines.

1010 W. H. Douglas, High-street, Stourbridge. Improvements in the manufacture of jet and other orna-

ments.

1011 J. Howden, Glasgow. Improvements in the materials for preventing the escape of heat from the surfaces of cylinders, boilers, and other vessels or apparatus containing heat.

1012 U. Scott, North-street, Fitzroy-square, Middlesex. Improvements in railway and other carriages, and various parts of the same, some of which may be used for other nurroses.

purposes.

1013 W. E. Broad, Wychdon, Staffordshire. Imments in the construction of loose railway whee

1014 G. F. Griffin, Great George-street, Westminster. Improvements in the permanent way of railways and

namvays.

1015 D. J. Hoare, Princes-terrace, Bayswater. Improvements in atmospheric railways.

1016 S. Sharrook, Liverpoel. Improvements in | the statement of reefs.

1017 F. Boyd, Boston, Suffolk, Massachusetts, U.S.A. Certain new and useful improvements in the construction of breech-loading firearms.

1018 F. W. H. Medhurst, Chancery-lane. Improvements in lamps.

1019 J. G. Tongue, Southampton-buildings, Chancery-lane. Improvements in parasols or umbrellas.

Dated April 5, 1869.

1020 G. A. Ermen, Eccles. Improvements in breech-loading firearms and cartridges relating thereto.

1021 W. Johnson, Elms, Sketty, Swansea. An improvement in machinery for compressing the carbonaceous, resinous, or other combustible substances employed in the manufacture of compressed fuel, which improved machinery may also be employed in moulding clay and other building materials.

uilding materials. 1022 J. Wood, J. Hampson, and L. and G. Fish, Preston.

building materials.

1022 J. Wood, J. Hampson, and L. and G. Fish, Preston. Improvements in looms for weaving.

1023 J. U. Askham, Sheffield. Improvements in the manufacture of anvils.

1024 J. Fletcher, Heywood, Lancashire. Improvements in the construction of firebars to be employed in furnaces.

1025 F. Commasi, Rue du Colysee, Paris. Improvements in obtaining motive power from flow of the sea, and in machinery for applying the same.

1026 W. G. White, Laurence Pountney-lane, City. Improvements in the manufacture of iron or steel safes, safe and strong-room doors, and other like structures, parts of which improvements are applicable to other purposes.

1027 W. Jones and T. Sheffield, Manchester. Improvements in boilers employed for generating steam.

1028 J. Winter, jun., Wardour-street, Soho. Improved apparatus for filling glass bottles and jars with soups, jellies, fruits, and other edibles for the purpose of preserving them, the axid apparatus being also applicable for filling bottles with sauces, wines, spirits, beer, liquors, and other still and effervescing beverages; also machinery, in combination with the above apparatus, for corking or stoppering such said bottles and jars.

1029 C. Cairns, New York, U.S.A. Improvements in heating by steam for manufacturing and other purposes.

1030 J. W. Drummond, Schenectady, New York, U.S.A. Improvements in looms for weaving.

1031 J. Greenslade, Steeple, Essex. Improvements applicable to traction engines.

1032 J. Sterriker, Great Driffield, Yorkshire. Improvements in pressing apparatus for expressing oils and other matters from seeds or other similar substances in which

ments in pressing apparatus for expressing oils and other matters from seeds or other similar substances in which those matters are contained.

### NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," April 6, 1869.

3699 J. R. Swann 3708 A. Mabson 3741 W. H. Pottle 3744 G. P. White 3768 T. Holder and G. Dover 3555 W. H. Ibbett 3563 W. H. Dreaper 3582 T. Craig 3584 W. R. Lake 3534 W. R. Lake
3535 S. Brook and C.
Thompson
3586 D. S. Merry
3592 E. T. V. Hecke
3606 A. Busche
3607 E. T. Hughes
3608 H. Pollack
3611 J. H. Moreland and
J. Coulong
8612 A. Harris
3615 A. C. Bamlett
3616 T. G. Webb
3618 T. and A. L. Dickins
and H. Heywood
8620 J. H. Dales and J. F.
Maygrove and E. 144 J. Loader and W. H. Child
154 N. Voice
187 H. A. Bonneville
385 O. Sarony
439 H. B. Binko
13 J. Loader
518 E. Hewett
576 G. Rees
676 J. Loader
693 C. Fairbairn
7739 A. Moncreiff
740 D. Johnson
762 H. J. B. Kendall
801 W. Campion
803 L. Engel
809 B. Latham
1919 H. A. Bonneville 8620 J. H. Dales and J. F.
Maygrove
3623 J. Ingham and L
Butterfield
8624 E. S. Samuell
8626 H. J. H. King
8629 W. E. Gedge
8637 W. Soper
3646 W. M'Lellan
3658 J. H. Johnson
3662 P. Ellis
3663 P. Ellis
3666 E. Hely
3670 S. Pallant 3670 S. Pallant 3680 J. H. Banks 3692 J. G. Rollins 3693 W. G. Ainslie 919 H. A. Bonneville

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application. of the objection to the application.

#### LIST OF SEALED PATENTS. Sealed April 2, 1869.

1 2, 1869.

3090 M. P. Manfield
3022 A. M'Millan
3107 B. Walker and J. F.
A. Pfiaum
3120 C. D. Abel
3131 F. A. Le Mat
3150 H. Hudson
3158 A. Robins
3168 B. M. Marchant
3169 W. C. Church
3169 W. C. Church
3169 B. Hunt
3191 C. Whitehouse
3225 H. Warner
3237 A. B. Berard
3238 B. Dowling
3260 H. E. Newton
3313 J. Heaton
3312 I. S. Sharrock
3468 C. K. Bradford 3009 J. F. G. Kromschroeder 8011 D. and D. Crichton and W. Donbavand and W. Donbavana
3015 A. Thorpe
3022 A. Monsnergue
3024 B. F. Drury, J. E.
and W. G. Walker
3027 T. O. Parson
3001 J. Rogers
3004 E. A. Cowper
3040 E. T. Bellhouse and
W. J. Dorning
3041 E. Simons W. J. Dorning
8041 E. Simons
3043 J. R. Wigham
3047 R. Ramsay
2050 J. G. Willans
3052 J. Jeffreys
3054 F. P. Warren
2067 W. Estor and C. T.
Pearce
8068 W. Richards
3072 J. Chaudron
20762 T. Sagar and T. 3321 S. Sharrock
3469 C. K. Bradford
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3634 J. Heaton
3642 D. Greig and J. 3643 D. and T. Fernie 204 J. Wilkins

#### Sealed April 6, 1869.

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3060 E. T. Hughes	3235 T. Carr
3061 W. Rossetter	8244 M. Sautter
3074 J. M'F. Gray	3245 M. Sautter
3079 J. H. Johnson	8352 M. Sautter
3081 J. Steel	3387 J. H. Johnson
3084 J. Arnold	3440 E. Haas
3100 E. Evans	3465 H. E. Newton
8106 W. T. Read	3603 J. Sincock
3111 F. Barnett	3635 W. Navlor
3112 T. Merz and G.	3649 A. V. Newton
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3114 S. J. Maccarthy	138 R. Craig
3115 F. A. Abel and E. O.	195 C. J. Chubb
Brown	214 J. Millward
3154 W. E. Gedge	222 J. M. Merrick
S166 T. and T. Vicars and	275 N. C. Szerelmey
J. Smith	281 S. Smith
3226 C. M'Millan	

### PATENTS ON WHICH THE STAMP DUTY OF 250 HAS BEEN PAID 1000 W. Clissold 1007 J. Foster and J. Hol-

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851	743	763	781	801	838	854	870	
439	745	765	783	803	840	856	572	
627	747	767	785	805	842	858	876	
652	749	769	789	807	844	860	878	
693	751	771	791	809	846	862	850	
696	753	773	793	817	848	864	882	
723	757	777	797	819	850	866	884	
733	761	779	799	836	852	868	886	
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### OF SPECIFICATIONS PUBLISHED For the week ending April 3, 1869. LIST

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NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office MoneyOrder should be sent, payable to ROBERTSON, BROOMAN, and Co, Patent Department, 166, Fleet-street, London, E.O, to whom all communications upon the subject should be addressed. tions upon the subject should be addressed.

Science and Art.—A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brocches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVI.] SCIENCE AND ART .- A striking instance of the



THE

### MECHANICS' MAGAZINE.

LONDON: FRIDAY, APRIL 16, 1869.

#### THE GREAT INDUCTION COIL.

NE of the greatest scientific wonders even in this wonder-producing age is unquestionably the great induction coil—or inductionably the great induction coil—or inductionium, as the German physicists term it—at the Polytechnic Institution. It is an instrument of remarkable power and capacity, and possesses the highest scientific interest. We possesses the highest scientific interest. We briefly described this apparatus three weeks since, but, as a marvel of science, it deserves a more detailed notice than our time then permitted us to give. In designing this induction coil, which is about six times as large as any previous production of the kind, Professor Pepper's object was to obtain an easily controlled source of electricity, combined with a degree of tension sufficient for the scenic requirements of the Polytechnic. In carrying out this object, the Professor enlisted the services of Mr. Apps, of the Strand, who has himself effected many important improvements in induction apparatus, and to whom is due the construction of the present powerful machine; but, although so extremely powerful, it is nevertheless perfectly safe to the manipulator, so carefully has every contingency of accident been guarded against. The machine consists of an ebonite barrel, 9ft. 10in. in length, supported at each end on two ebonite pillars. The barrel was made at the Silvertown Works, and is the largest ever turned out there. I contains the compound coil, and of itself weighs 477lb., the whole machine weighing 15cwt.

The primary wire is of copper of the highest conductivity 0.0925 in. diam. (B.W.G., No. 13), and 3,770 yards in length; the number of revolutions of the primary wire round the soft-iron core is 6,000, its arrangement being three, six, and twelve strands. The total resistance of the primary coil is 2.201400 British Association units; and the resistances of the primary conductors are respectively for the three strands, 0.733800; for the six, 0.366945; for the twelve, 0.1834725 B.A. units. The soft iron core is composed of straight wires of very soft iron, each wire being 5ft. in length, and 0.0625in. in diameter. The diameter of the bundle of core wires is 4in., and their weight 123lb. The secondary wire is 150 miles in length, 0.015in. (B. W. G., No. 29), diameter, and is covered with silk.
total weight of the wire is 606lb., its electrical resistance 33,560 B.A. units. This secondary coil is 4ft. 2in. long, and the insulation is calculated for safety at 95 per cent. beyond absolute requirement. The secondary wire is insulated from the primary by an ebonite tube 8ft. in length, and lin. in thickness. The condenser is made with sheets of varnished paper and tinfoil, arranged in six parts, each containing 125ft. super, or a total of 750ft. super.

The machine was originally tried with a contact breaker detached from the great coil,

and having an independent electro-magnet; this worked well up to ten Bunsen cells with the great inductorium, but when the battery was increased to thirty or forty cells it became unmanageable. A Ruhmkorff break, with platinum amalgam and alcohol above it, was substituted, which saved the points, but the spirit was now and then violently ejected and set on fire. Professor Pepper then proposed a modification, which has proved successful, remaining in perfect working order during a series of experiments extending over eight hours. The commutator regulating the

is most carefully and effectually insulated from the floor and surrounding apparatus, as are also the separate portions of the appaare also the separate portions of the apparatus from each other. The battery power is at present supplied by forty Bunsen cells, each containing a pint of nitric acid. It is, however, intended to substitute for this, a Grove's battery of the largest size ever made, and which is in course of construction. It will consist of pipeclay cells, 2ft. square upon the sides, and 3in. wide, with walls an eighth of an inch thick of an inch thick.

In working the great induction coil, the sparks obtained from it with five Bunsen cells are 12in. in length; ten cells give sparks 14in. in length; fifteen cells give 17½in. sparks; twenty cells give 21in. sparks; twenty-five cells give 23in. sparks; thirty cells give 23½in. sparks; thirty-five cells give 26in. sparks; forty cells give 27½in. sparks; thirty-five cells give 27½in. sparks; forty cells give 27½in. sparks; forty cells give 27½in. sparks; and with fifty cells, sparks from 28in. to 29in. in length were obtained. After eight hours working, the coil gave, with fifty cells, a spark 25 in. in length. It was also found that of the proportions of the condenser used, one-half gave the longest spark. The spark is not such as is generally produced under similar circumstances, but is a thick wire of light, surrounded by a wide waving flame 2in. or 3in. thick, and, which can be blown aside from the spark. The spectroscope gives a perfectly continuous spectrum, like the light of day, only that it is barred with the bright lines of the substances in combustion. flame of the spark, with a very slight blast of air, rises to, at least, 12in. in height when it is passing about the same distance horizontally.

Besides the gigantic Grove's battery, there

is also a Leyden battery in course of con-struction, the present one being inadequate to represent the full power of the coil. The first part of this battery, consisting of 250ft. super of coated glass, is now nearly completed. There is also a very large and elegant arrangement of Gassiott's cascade in course of construction, which is also to work with the great induction machine, and which will embody several important improvements that have been suggested by Mr. Gassiott. The most recent experiments with the coil have shown that as yet no limit as to the quantity effects can be established, and it is exceedingly probable that by a very few minutes' working, the large coil would charge, at least, 1,000 Leyden jars of very large size. The coil too, is probably destined to throw a new light upon scientific research, and to solve the pro-blem—what is ozone? In reference to the amount of this element, and the density at which it may be produced, very few experi-ments have as yet been made. But enough is seen in the extraordinary reddening effect of the flame of the spark on litmus paper, to show that we are likely very soon to solve the ozone problem.

#### COLLECTING AND UTILIZING SEWAGE.

HE two main points in the sewage question are, the effectual removal of refuse and foecal matter from our dwellings, and its effi-cient utilization upon our lands. Upon these points there exist a great variety of opinions, some advocating one method of removal and utilization, and some another. Into the various methods proposed, suggested, or in use, we need not here enter; they are sufficiently well known to all who know anything at all about the matter. We point to our Metropolitan main drainage as a sufficient answer to the first point in question, and to the Croydon irrigation works as an equally sufficient answer to the second. But it may be said that our cities and towns are not Londons nor Croydons, and that many a cluster of habitations are neither cities nor

sewage? Of course, everybody will say there are many ways of doing that. admit there are, and we will now point out one of them, the most recent that has come under our notice. This is the system of M. Delbriel, which was explained to a meeting of gentlemen practically interested in the sewage question on the evening of yesterday week. The meeting was held at the Inns of Court Hotel, Holborn, the Duke of Castelluccio in the chair. M. Delbriel's system of collecting and utilizing sewage is better known in France, where it is practically applied in several places as vidance a vapeur. It consists in using a traction engine, to which are attached tanks, into which the sewage is pumped by the engine. During the extraction of the sewage, the mouth of the cesspool is covered with sailcloth steeped in sulphate of zinc. The mephitic vapours are drawn off from the tanks by means of pipes which communicate with the engine furnace in which they are burned. By these means, it is affirmed that no unpleasant smell nor noxious vapour ever finds its way to the air, whilst the sewage in the highest condition for fertilizing purposes does find its way on to the lands of the farmers. Depôts are established where the sewage is deposited, and from which it is distributed to the farmers. Or otherwise it is supplied on to their lands direct from the tanks. In all this there sounds to our ears-who have been accustomed to a widely different dealing with the same question-a return to the old cesspool system, the engine doing duty for the horse and men of the old night cart. But it must be borne in mind that with all our sanitary progress there are yet many spots in Great Britain where the system would be a great boon, and to these M. Delbriel proposes its application. That it has proved a great success in France is due to the very different sanitary and agricultural conditions of that empire as compared with the United Kingdom. On the whole, M. Delbriel's Kingdom. On the whole, M. Delbriel's system is well worthy of consideration, and, therefore, we subscribe to the following resolution, which was passed at the meeting in question:—"Considering the present great waste of the sewage of towns, &c., and the necessity of diverting it from rivers and streams, and the value of applying it to the purposes of agriculture, this meeting is of opinion that M. Delbriel's system is worthy the attention of the public, and more especially all persons interested in this important question, and that it is desirable that M. Delbriel should issue a translation of his pamphlet."

#### CLEANING THE EXTERIOR OF HOUSES.

EVERY building in which the constructive material does not constitute to a great extent the ornamental and decorative as well, extent the ornamental and decorative as well, must, in a comparatively brief period of time, present apparent traces of external ruin and decay. A house just completed, of which the walls are covered with stucco, or, in Mr. Ruskin's language, "slime," looks well enough for about a year, if it be erected in London or any of our large provincial towns, where the numerous influences of a mocky and connumerous influences of a smoky and contaminated atmosphere quickly contrive to take the shine off it. Even in more favour-able localities, a "slimed" house cannot be expected to appear decent for more than three years, the term of the shortest lease of tenancy. Where painting is resorted to, the necessity for renewing the "vencering" of the exterior of a building is demonstrated much earlier than in the former instance. At present, provided there is no absolute danger of a house falling down, the owner may please himself about its exterior appearance. He may paint or renew the face of it once a year if he pleases, or he need not do it from the time admission of the battery current is provided towns. Then naturally follows the question it is erected to the day it is pulled or burnt with a locking apparatus, and the whole coil of how to deal with a limited amount of down, if such suits his convenience. It is on this

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account that the shops and buildings in our streets and thoroughfares present so bizarre and incongruous an appearance. In one case, we have a tradesman determined to go along with the spirit of the age, and putting up a new shop front, and painting his house, in order to bestow upon it a fictitious look of modernism. In the other, either next door or vis a vis, there is to be found an example of the old school, who considers respectability to depend upon small and dirty panes of glass, and his solvency to be in the inverse ratio of the light and air admitted into the interior of his premises. As a consequence, we find a handsome and elegant façade, fit to figure in the chief street of any metropolis, kept in countenance by a murky, dismantled old building that would have been a disgrace to the purlieus of St. Giles in its palmiest days. While builders are bound by tolerably strict regulations respecting the actual erection of houses, and the compliance with sanitary requirements, there is no clause which takes the slightest notice of the maintenance of their work. It may be maintained in a complete state of repair and efficiency, or it may be suffered to fall into decay with impu-

This question has been recently taken into reconsideration by our Gallic neighbours, and towards the end of last year an order was issued by the Prefect that the façades of all dwellings in the 3rd, 4th, 9th, and 10th divisions (arrondissements) of Paris should be periodically cleaned, the law to take effect on and after May 1 of the present year. So far back as 1852 there was a law promulgated to the same intent, but its injunctions have been so frequently neglected that the authorities have thought it requisite to call prominent attention to it by issuing what might be termed a new edition. The old Act ran as follows :-- "The façades of houses are to be kept in good repair. They are to be rubbed, plastered, painted, or the surface either renewed by cleansing in some manner or another, at least once in every ten years, at the expense of the proprietor. A noncompliance with this regulation will subject the offending party to a fine not exceeding £5." Although the legislation thus insisted on the general principle, the particular modus operandi, or means of putting the principle into execution, was left altogether to the discretion of the owner. The favourite method which has been successfully practised for the last two years, is that of cleaning the walls by the employment of a jet of water projected under steam pressure. There are many advantages steam pressure. attached to this plan of proceeding. It not only restores the façades to their original appearance, but it does not injure the more delicate, decorative, and ornamental portions of the building, neither does it destroy the then protecting coat which the stone has received from the influence of the atmosphere. By this method we ensure the fulfilment of several valuable conditions. First, cheapness; second, the preservation of the more fragile and sculptural work upon the edifice; and, third, universality of application. If, in addition to the enforcement of some regulation of this description, with respect to the buildings in our principal streets and thoroughfares, those in our narrow courts and alleys were brought under the same jurisdiction, the result, in a sanitary point of view, might not be inconsiderable. It has been calculated that were the exterior of the buildings in London kept in a clean fresh condition, instead of being nearly black from top to bottom, there would be a gain of nearly half an-hour's daylight in every twenty-four hours.

### THE INSTITUTION OF NAVAL ARCHITECTS.

large vessels in Her Majesty's navy. favourable report on the proposed method, by Sir W. Armstrong and Mr. Penn, has led apparatus, constructed from Captain Inglefield's designs, being fitted to H.M.S. "Achilles." Several methods have already been proposed, and some of them successfully put into practice, for bringing hydraulic or steam power to bear on the tiller. of these, steam has been the prime mover. The "Minotaur," for instance, has an hydraulic steering apparatus, worked by a donkey engine, which has always to be kept at work pumping water to waste, so as to insure the assistance of the apparatus when needed. Here is a decided want or economy.

the chief features of Captain Inglefield's plan

the chief features altogether. The motive power he resorts to is the hydrostatic pressure at the lowest point of the ship's bottom. The water is admitted here through a Kingston valve at a depth of 20ft. The pressure of this water, acting on a piston of 36in. area, works a reciprocating pump. From this pump a couple of wrought-iron 2-inch pipes are led to two cylinders, one on each side of the lower tiller, these pipes being constantly full. By means of a slide contained in a slide box, and worked by a wheel in the pilot house, the engine is set in motion, and the hydraulic pumps brought into action. This slide can be made to lock the water in the two cylinders, and so the helm may be kept over at any angle that is desirable. Now, all this is very nice. We have been working our helm at no expense to ourselves. This is certainly economy. In fact, it is too good to be true. How are we to account for the apparent impossibility? It is this—the ship is now deeper in the water, owing to the weight of the water we have admitted through the valve. All this water must be pumped out again. However, on this score, Captain Inglefield quietens our apprehensions. He tells us that the "Warrior's" helm can be put hard down every fifteen minutes for ten days, by admitting no more water than is admitted into her condensers in the course of one hour. getting rid of this water, therefore, cannot offer much difficulty, nor can it be a serious objection to this method. The chief advantage of Captain Inglefield's method can be put thus: the power that he relies on is that of a faithful servant, who, though he costs next to nothing to keep, is always wakeful ready, and fresh, while the power relied on in other methods is that of a pampered menial, who eats his head off in his idleness, and when he is wanted on an emergency is sure to be caught napping.

At the meetings of the Institution, last year, Mr. Saxby read a paper on testing iron by magnetism. This year the same subject was followed up by Mr. Saxby in a further paper, "On the Qualities of Boiler Plates. Last year, the Secretary for War allowed Mr. Saxby to make a course of experiments at the Enfield Factory, and, if successful, Mr. Saxby was to have his expenses paid. This reminds us of the old quack's cry, "No cure, no pay!" In this case, the cure, so to speak, has been so far successful that the patient has actually paid the fee. An example will best show the nature of Mr. Saxby's investigations at Enfield, and the success attending them. One individual barrel was selected as the subject of experiment. This was tested by the magnet, first, as it came from the fire; again, a second time, after it had been turned up in the lathe; and, a third time, after it had been ground and bored. In each stage the magnet pointed out a flaw not far from the muzzle, and running down the barrel for a few inches. In short pieces, cut off from the barrel, and examined care fully, what are technically called "greys" were discovered in flaws in the metal. If

the metal, but the lynx-eyed magnet is not to be baffled by a stone wall, or a few inches of iron. It affords a means of detecting flaws, which at present we have no other means of ascertaining.

During the past year, Mr. Saxby has been devoting his attention more especially to applying his magnetic test to boiler plates. The master boiler maker in one of the Government yards supplied Mr. Saxby with a carefully-selected piece of a partly-used plate, that had passed through all the Admiralty tests. This specimen was not a foot square, and was given as a sample of the very best rolled plate that could be got for love or money. The magnet assailed this champion of a plate, and with a quickness that was almost suggestive of error, pointed out a weak point. However, the place was marked, and the master boiler maker, on re-examination, was forced to confess that his specimen plate was not without its weak point. A plate, formed of three, rolled together, is transparent to the magnet's eye, and it will tell whether the middle layer of the sandwich is as good and sound as the outer layers. In fact, the author of the paper says that no trick of trade like this can escape detection by the magnetic test. In these days of freedom of thought and liberalism, we are taught to put no faith in tests, and to disbelieve all claims to infallibility. Here, however, we find a gentleman putting forward a test which we cannot but allow has some virtue in it, and one for which he claims the higher attribute of infallibility.

### THE ROYAL INSTITUTION.

AST week, at the Royal Institution, Pro fessor Robert Grant, F.R.S., Superin tendent of the Observatory at Glasgow, gave the first of a series of nine Tuesday afternoon lectures upon "Stellar Astronomy." opening lecture dwelt principally upon the historical part of the subject and upon elementary facts. On the following Thursday, Professor Tyndall delivered the first of a course of lectures upon "Light." His opening address also was of a very elementary character, but he introduced a new experi-ment to prove that the angle of incidence of light is equal to the angle of reflexion. A rod of brass, graduated in inches, was supported in a horizontal position, and from its centre a thread, drawn tight by a plummet descended into a basin of water, coloured with ink in order to get rid of all but surface reflexion. A small dimple was necessarily made at the place where the thread entered the ink. A small paraffin lamp was then placed with its flame nearly touching the rod, and at about a yard from the central thread. Upon bringing the eye along the other end of the rod, and watching the small dimple in the water, it was seen to be most brilliantly illuminated when the eye was at the distance of a yard from the centre of the rod, thus proving that the angle of incidence is equal to the angle of reflexion. To whatever distance the lamp was shifted from the central thread, the eye had to be placed at a similar distance on the other side to get the most brilliant reflexion. On Friday evening, Dr. Carpenter, V.P.R.S., lectured upon "The Temperature and Animal Life of the Deep Sea. The lecture was highly interesting, but we are obliged, for want of space, to defer our notice of it until next week.

### HANCOCKS' NEW SCREW PROPELLER.

[N the MECHANICS' MAGAZINE for September 18 last we described and illustrated CAPTAIN INGLEFIELD, R.N., read a paper on a method proposed by him for applying hydraulic power to the steering of Here the "greys" lay hid in the thickness of recorded a series of experiments which had

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been made with it against a Smith screw, and which were highly in favour of the Hancock screw. We are glad to be able to state that recent and independent trials of the system in Holland have confirmed the results of the experiments made in England. It appears that M. Van der Made, of Dordrecht, ordered a screw from Messrs. Hancock for a steam launch 30ft. long and 6ft. beam. The engine The engine has a cylinder 4in. diameter and 7in. stroke, and the propeller with which she was originally fitted was a Smith screw, 30in. diameter and 3ft. pitch. The steam was used at 70lb. pressure. The Hancock screwis 28in. diameter and 28in. pitch, and the result of working is found to give an increase of 25 per cent. in speed against the tide over the Smith screw, the conditions of working being the same in both cases. These results are stated in a letter now before us from M. D. J. P. Van der Made, who is a son of the proprietor of the launch, and is at present a student at the Royal School of Naval Architecture, South Kensington. This result is highly gratifying, because with 2in. less diameter in the Hancock screw we might not have been surprised at equal or even inferior results to the Smith screw. But it is a great point in its favour that it made an absolute gain of 25 per cent. With such results, the Hancock screw has a promising future before it, and we shall be greatly deceived if it does not realize our predictions of success.

# THE NEW INSTRUCTIONS OF THE GAS REFEREES.

THE requirements of the Gas Acts of 1868 have necessitated the preparation of a new set of instructions by the gas referees, and this time, we presume, we are not wrong in concluding that they are definitely issued to the examiners. These revised directions offer but little that is new, and we only refer to them for the purpose of taking up one or two points which we left unnoticed in our last remarks. Let us, first, however, congratulate the referees on the progress they have made in chemistry during the last six months. Within this period they have been converted from the old to a new (not the newest) system of chemical nomenclature. What they called sulphate of baryta in October, 1868, is sulphate of barium in April, 1869. The equivalent weight of the substance, which was 117 in October, is now 116.5, in accordance with more recent determinations. Next October we shall probably arrive at barium sulphate, and find the atomic weight adjusted to the very latest deter-mination of Stas calculated to two or more decimal places. This, at all events, indicates a willingness to receive instruction, which is beyond all praise.

One point to which we have not before alluded is the introduction of corrections for variations of temperature and atmospheric pressure, in determining the quantity of gas burnt, in estimating its illuminating power and purity. This, at first sight, gives an appearance of wonderful accuracy, but a little reflection shows it to be exceedingly absurd. In the first place, no regard is paid to these variations in charging the consumer for his gas. A cubic foot, as measured by the meter, is charged as a cubic foot, whether the barometer stands at 28in. and the temperature is 82deg. Fah., or whether the pressure is 31in. and the temperature 40deg. Fah., just as a gallon of spirit is a gallon of spirit, whether it is measured in the depth of winter or the height of summer, although everybody knows that a considerable change of volume takes place in spirit within the range of temperature of the two seasons. On this ground alone the introduction of these corrections is distinctly objectionable, but we object to them for the further reason that they do not and cannot conduce to accu-

gas, passing through a meter at the rate of 5ft. per hour assumes the temperature of the surrounding media, and we know that it is subjected to a pressure differing some-what from that of the atmosphere. This, then, and the fact that the corrections are only made for differences of two degrees of temperature, and tenths of an inch of pressure, completely takes away the appearance of scientific precision from the results obtained. But it is, when we come to the instructions for sulphur determinations that the absurdity comes out most strongly. The experiment goes on for twenty-four hours. The barometer and thermometer are read once each day, and the mean of these two observations is taken to represent the pressure and temperature of the twenty-four hours. But suppose-and it is no violent supposition—that in the course of the twenty-four hours, the barometer sinks 0.5 and rises again 0.6, the thermometer, in the same time having a range of 10deg., what idea would the mean of two such readings as these give of the average pressure.

Such is the statement we should find in the examiner's record, but in the same time, the maximum and minimum readings have been as follows:—

It is clear, that these latter calculations would be much nearer the truth than the former, but, after all, might be very wide of the actual truth. We shall probably be told that, on the whole, it will be found perfectly fair, the governed every entitle hing all night fair-the general average will bring all right. No doubt of it; and why give all this unnecessary trouble. If the referees had ascertained the mean pressure and temperature in London for the past year, they would probably have found that the pressure was 29.8, and the temperature nearly 52deg. On looking to tables, we find that to correct the volume of gas under these conditions, 9 have to be added to 1,000, a result which we know to be scientifically valueless, but which would be rather against the companies as regards illuminating power. As, however, the temperature will always be taken in the photo-As, however, the temmeter-room, the corrections are certain to be on a vast majority of days in favour of the companies.

There is one other point, with respect to these sulphur determinations, which we must notice. The referees direct two experiments to be made simultaneously, and the mean of the two results to be taken, to express the amount of sulphur in the gas. Now, as everybody knows that some sulphur always escapes in the process they employ, and as the apparatus they supply is singularly well adapted to facilitate the escape of a great deal; and as, moreover, the sulphur found can only come from the gas burned, any reasonable man would conclude that the maximum result must be nearest the truth. So, no doubt, the referees well know, but they do not act on their conviction.

they do not act on their conviction.

We come next to the ammonia determinations, which we must dismiss very briefly. We will suppose the gas to contain the five grains of ammonia in 100ft., as permitted, and that 20ft. have been burned. Thus the liquid in the cylinder will contain one grain of ammonia. Half this liquid is to be set as is distinctly objectionable, but we is distinctly objectionable, but we be is distinctly objectionable, but we be introduction of these corses is distinctly objectionable, but we be introducted in the further reason that o not and cannot conduce to accultions to be rigidly accurate, which is suppossing the test solutions.

ing a good deal, it is no reflection on the most careful examiner to say that he is never likely to hit the exact point of saturation. Some amount of error is inevitable, and in calculating the results for 100ft., this error will be multiplied just fifty times. The error, we need hardly say, is certain to be in favour of the gas company. It must not be supposed, from what we have said, that we at all sympathise with the offensive agitators who are continually worrying the gas companies, and striving to depreciate the value of their property. All we wish for is to see a sound, scientific, and fair system of gas testing; and this, we hope, the referees will in time supply us with. We can afford no more space for this subject to-day, but some further practical considerations remain, which we shall refer to on another opportunity.

METEOROLOGICAL RESEARCH BY AID OF THE ELECTRIC TELE-GRAPH.—No. I.

METEOROLOGY in its largest sense is a subject which althous IVI subject which, although great collections of observations have been made, is hardly yet a science; yet the interpreters of this part of the book of nature have already begun to spell out some phrases, which show that the language is not wholly unintelligible. And here, therefore, we may go on hopefully, recollecting always that the collection of facts is a matter of comparatively small value, except we can also trace in them some rule or order. The mere gathering of raw facts may be compared to the gathering of the cotton from the tree. The separate filaments must be drawn into a connected thread, and the thread woven into an ample web, before it can form the drapery of science." These words were addressed by the celebrated Dr. W. Whewell to the British Association, in 1841, but they apply with equal force to the present time, and should be on the mind of every meteorologist. In 1848, a short but remarkable paper was read to the British Association, by John Ball, M.R.I.A., which, as being probably the earliest distinct state-ment of the advantages likely to result from pressing the electric telegraph into the service of meteorology, may be reproduced with interest.

What is properly termed the weather, is a general expression for the physical condition of the atmosphere with reference to heat, pressure, moisture, and the velocity and direction of its motion. Two classes of causes determine these conditions at any given point of the earth's surface. The first class may for short periods of time be considered as constants, depending on the position of the point of observation on the globe, and the physical conformation of the adjoining districts. The second class, upon which the proverbial uncertainty of the weather depends, arises from the influence exerted by each portion of the atmosphere upon those surrounding it, by virtue of which a disturbance of equilibrium at any one point is rapidly propagated in all directions. In common language, this is expressed by saying the direction of the wind is at once the cause and the indication of changes of the weather. However far we may be from a general solution of the problem of atmospheric disturbances, meteorologists have made considerable progress in tracing the connection between successive states of the weather, owing to the mutual influence of contiguous portions of the atmosphere. These cases have been studied a posteriori, comparing the known results with observations extending over considerable areas. Now that we have the means of receiving information in an indefinitely short space of time by the electric telegraph, these problems, under favourable circumstances, may be studied a priori. In London, we may receive instantaneous intelligence of the condition of the atmosphere, as to the five above-mentioned elements, from nearly all the extremities of Great Britain. With a delay of about four hours, we can the similar intelligence from the western part of Ireland, and with a still shorter delay, our communications may extend to the centre of France, the banks of the Rhine, and even to Hungary and Poland. I do not pretend to say that with such elements for calculation, we should at once be enabled to predict changes in the

determinations thus arrived at would possess a high degree of probability. The ordinary rate at which atmospheric disturbances are propagated does not seem to exceed twenty miles per hour; so that with a circle of stations extending about 500 miles in each direction, we should in almost all cases be enabled to calculate on the state of the weather for twentyfour hours in advance.

Very remarkable it is that this paper shadowed forth so completely the actual system of telegraphing the weather carried out by Admiral Fitzroy in 1860; and still more remarkable is the fact that the results anticipated from the employment of the telegraph in meteorological research should have been fully realized in the Admiral's weather forecasts and storm warning signals. The only wonder is that the plan was suggested so many years before its adoption, more especially as the idea of telegraphing the state of the weather was familiar to men's minds, and repeatedly brought into public consideration.

In the "Annuaire Meteorologique de la France" for 1849, M. C. Martins urged the establishment of meteorological stations at the French telegraph offices; adding, "some day their employee, habituated already by the nature of their duty to exactness and observation, will be charged with the duty of reading and using meteorological instruments.' recommendation was, however, not carried into practice until 1857, when M. Leverrier, the Imperial Astronomer, arranged a meteorological service for France, by the agency of the telegraphs, for the purpose of sending around the coasts intelligence of existing weather. Twenty-four towns suitably chosen upon French territory, and provided with the requisite instruments, sent every morning to the Observatory at Paris the state of the sky, the direction and force of wind, the temperature, and the barometric pressure for the whole extent of France. Soon after, an interchange of these telegraphic communications was effected with foreign observatories.
Madrid, Lisbon, Turin, Florence, Rome,
Brussels, Copenhagen, Stockholm, Haparanda, Warsaw, St. Petersburg, and Moscow, transmitted observations. Finally, Constanti nople and Algiers were in the exchange. All these observations were published daily in the "Moniteur," and reproduced by the daily journals. The interest taken in the meteorological returns is sufficiently evinced by the continuance of their publication to this day. To the mere newspaper reader, probably the thermometric observations are the most noteworthy, as the vicissitudes of temperature are frequently very striking over so large an area. But to all classes engaged in commerce and agriculture, this quick intelligence of existing weather must have been of great advan-

The system of giving warning of storms by signalling their advent from place to place was suggested while the old semaphoric telegraphs were in use; and the idea of effecting this object occurred at once to various persons in England and America when electricity became man's messenger. Captain Maury, then Director of the Observatory at Washington, in his well-known "Sailing Directions, edition of 1858, emphatically brought the subsubject forward in these words: -- "With a properly devised system of meteorological observations to be made at certain stations whereever the telegraph spreads its meshes, and to be reported daily by telegram to a properly organized office, the shipping in the harbours of our seaport towns, the husbandman in the fields, and the traveller on the road, may all be warned of every extensive storm that visits our shores, and while yet it is a great way off."

The British system of telegraphically communicating meteorological observations from distant stations to a central office in London had its origin at the meeting of the British Association for the Advancement of Science, held at Aberdeen in 1859 under the presidency of the lamented Prince Consort. The consideration of the subject resulted in the fol-

lowing resolution :- "The Committee of the Section of Mathematical and Physical Science, having represented the probable importance of occasional telegraphic communication between a few widely-separated parts of Great Britain and Ireland, by which warning may be given of storms, the General Com mittee recommends application to the Board of Trade for such an arrangement as may further this object authoritatively." Early in the following year, two meetings were held at Buckingham Palace relative to this subject, and it was decided that Admiral Fitzrov. the chief of the Meteorological Department of the Board of Trade, and who was also a member of the Council of the British Association, should be directed to organize a plan and carry it out as an experiment. When and carry it out as an experiment. the British Association met at Oxford in July, 1860, Admiral Fitzroy read a paper on "British Storms," and explained the measures proposed for meteorological telegraphy. These proposals obtained approval; there was no opposition. Thus supported, the Admiral at once put his plan in operation. In September of the same year, twenty selected telegraph stations, situated upon the coasts of the British Isles, were furnished with the necessary instruments, and com-menced making and reporting meteorological observations. Arrangements were also com-pleted with the French Government for a Arrangements were also commutual exchange of certain observations daily. The publication of the daily observations thus obtained was at once commenced in the newspapers; and the public was, for the first time, put in possession of reliable and accurate reports upon the daily weather, which were universally appreciated. The vague and unreliable statements of the prevailing wind and weather, hitherto received by telegraph, and published in the newspapers by private agency, had long been deemed insufficient and unsatisfactory. The new system of meteorological telegraphy thus commenced by Government has continued uninterruptedly to the present time.

As we have seen, it was from the first contemplated that simultaneous observations, rapidly transmitted to the central office, would afford ample prevision of dangerous winds and storms. The possibility of effecting this object was apparent to Admiral Fitzroy, for his previous investigation into the characteristics of British weather had led him to conclude that such observations were capable of yielding information sufficiently prognosticative to enable notice of approaching storms to be sent to all the coasts in time to allow of preparation being made for their advent. Accordingly, he proceeded to devise and inaugurate a scheme by which such information might be most simply signalled at the seaports and coastguard stations. first storm-warning signal was made in February, 1861, to the north-east ports. It was derided and disregarded at the Tyne ports, and on the three following days awful losses of ships and lives occurred on the east coast of England. The system of storm signals thus auspiciously inaugurated gradually gained the confidence of the seafaring community, and developed its accuracy and utility.

THE Emperor of the French recently examined THE Emperor of the French recently examined the Henry breech-loading rifle, which was introduced to his Majesty by Mr. E. H. Newby, of King William-street, City, on behalf of the inventor. The Emperor was accompanied by his Minister of War, Marshal Niel, and both readily understood the construction and manipulation of the weapon. The Emperor expressed himself as being much pleased with the working of the rifle, as did also Marshal Niel. Mr. Newby, at the same time, introduced to His Majesty's notice a new cartridge pouch, the invention of Major-General Morris, of the United States Army, the European agency of which has States Army, the European agency of which has been placed in Mr. Newby's hands. Both the Emperor and his minister appeared pleased with the arrangement of the pouch, and, at the close of the interview, his Majesty intimated that it had given LONG AND SHORT IRONCLADS. BY MR. E. J. REED, C.B.

(Continued from page 258.)

S far as our experience goes, then, I am warranted A in making the assertion, that in armoured ships, as the extent and thickness of the armour to be as the extent and thickness of the armour to be carried are increased, the proportion of length to breadth should be diminished, and the fulness of the water-lines increased; and that the shorter, fuller ship can be propelled at as great a speed as the longer finor ship with about the same, or only a little greater, horse power. The constants of performance will undoubtedly be lower in the shorter ship; but they are only hymothetical standards of merit and they are only hypothetical standards of merit, and the benefits in point of first cost, handiness, and maintenance, resulting from moderate proportions, are tangible facts, far outweighing in importance, the small economy of steam power resulting from the adoption of greater proportions and fineness of

One other point requires attention, when we are dis-One other point requires attention, when we are dis-cussing the propriety of building very long ironclads— the fact that in such ships the proportion of frictional resistance to direct head resistance becomes consider-ably increased. It appears probable, even, that if very extreme proportions were adopted, the advan-tages resulting from the reduction in head resistance would be more than counterbalanced by the increase in frictional resistance. To illustrate this statement, in frictional resistance. To illustrate this statement, I will suppose a fully armoured ship to be lengthened amidships, and made finer at the extremities, with a view to increased speed in proportion to engine power. In such a case, a great weight of armour would be added; the strength of the hull proper would require to be increased; and the immersed surface would be made so much greater, as to render the residual to the strength of the str surface would be made so much greater, as to render it questionable whether the saving in horse power, or the increase of speed, if any, would be at all conmensurate with the increased cost, or make amends for decreased handiness. Adding to this, the consideration that a greater area of immersed surface means a greater area subject to fouling, and that one of the chief causes of falling off in speed of a sea-going iron-built ship is foulness of bottom, we may, I think, fairly conclude that this is a feature of the question which ought not to be overlooked. which ought not to be overlooked.

That this is so will, perhaps, appear more clearly ships. Before doing so, I would observe that the advocates of long ironclads have at various times urged the importance of increasing the proportions borne by the displacement and the midship section to the indicated power, and have declared our recent ironclads to be wanting in these, which they consider the "chief elements of naval architecture." Having the "chief elements of naval architecture." Having so fully stated my own opinion on this matter in a previous part of this paper, I need hardly say that in using, as I shall do, these measures of efficiency, I only wish to make a comparison between two long ships, in a manner of which those who favour long ironclads must approve, and that I by no means agree to this method of comparing the merits of armoured ships.

The trials to which I refer, are those which took The trials to which I refer, are those which took place in the spring of last year, in which the "Warrior," "Minotaur," and "Bellerophon" were engaged. Taking the six hours' trials at see of the two long ships, it is found that the proportion of horse power to displacement in the "Minotaur" was 1,608 to 1,000, and in the "Warrior" 553 to 1,000, while the proportion of horse power to midship section immersed was 468 to 100 in the "Minotaur," and 404 to 100 in the "Warrior." In other words, the horse power is less per tan of displacement and section immersed was 468 to 100 in the "Minotaur," and 404 to 100 in the "Warrior." In other words, the horse power is less per ton of displacement, and per square foot of midship section in the "Warrior," than in the "Minotaur," although the latter is the longer ship, and has the greater proportion of length to breadth. It is proper to state that the "Minotaur" steamed faster than the "Warrior," so that her proportion of horse power was, on that account, somewhat greater than that of the "Warrior;" but in order that the proportionate expenditure of power might be the same in the two ships, the "Minotaur's" indicated power would have to be diminished by from 400 to 500 horse power, which is doubtless a greater diminution than would be necessary if the "Minotaur" were driven at the "Warrior's" speed. Here, then, we have a result which follows from the adoption of a standard of merit brought forward by the advowe have a result which follows from the adoption of a standard of merit brought forward by the advo-cates of long ironclads, but which goes against the theory that increased length and proportions tend to increased economy of steam power. I shall be glad to see this seeming contradiction explained, if that be possible; for my own part, I am inclined to think that these facts are confirmatory of the opinion previously expressed, that in very long ships the increase of frictional resistance is so considerable as to become, at least, as important as the decrease in direct head resistance. At the same time, I do not wish to appear to base a general theory on one or two trials; and there can be little doubt that limits do exist at which the increase of length ceases to be beneficial, whether these limits have as yet been reached or not.

reached or not.

In the course of last year, special attention was drawn to the relations which should subsist between the form and dimensions of ironcled ships, and the weight of material in the hull, in a paper read by me



before the Royal Society, and since published in their "Transactions." By the phrase "weight of material," I mean the weight of hull per unit of surface, say, per square foot, and when the armour is included, this is very different in different ships, varying with the extent and thickness of the armour. The methods and arguments of the paper are, in reality, applicable to both completely and partially armoured ships, including, in the latter class, ships like the "Warrior," without any protection at the extremities, and the very much more efficient ships with armour belts, and central, bow, or stern batteries. In order to make a fair comparison, however, between ships having different arrangements and thicknesses of armour and backing. I have thought it proper to distribute the total weight of protecting material over the whole length of the broadside in each case; thus, in fact, turning all ships into equivalent, but completely protected ships, for the purpose of comparison. By this means, a fair idea can be obtained of the relative defense are taken to compare their performrison. By this means, a fair idea can be obtained of the relative defensive powers of the ships considered before any steps are taken to compare their perform-ance under steam. To afford a general view of the methods employed, and the results arrived at, I have given the following abstract, which is a reprint of that sent to the Royal Society.

Abstract of Paper sent to the Royal Society "On the Relation of Form and Dimensions to Weight of Material in the Construction of Ironclad Ships.

The object of the paper is to show that the proportion of length to breadth in a ship, and the form of her water lines, should be made in a very great degree dependent upon the weight of the material of degree dependent upon the weight of the material of which her hull is to be constructed—that an armourplated ship, for example, should be made of very different proportions and form from those of a ship without armour, and that as the extent and thickness of the armour to be carried by a ship are increased, the proportion of length to breadth should be diminished, and the water lines increased in ful-

ness.
It is highly desirable that this subject should receive the attention of men of science, not only because it bears most directly upon both the cost and the efficiency of future ironclad fleets, but also because it opens up a theoretical question, which has because it opens up a theoretical question, which has hitherto, the author believes, received absolutely no consideration from scientific writers upon the forms and resistances of ships, viz., the manner in which the weight of the material composing the hull should influence the form. Prior to the design of the "Bellerophon," the forms of ships were determined in complete disregard of this consideration, and even the most recent works mon the subject mined in complete disregard of this consideration, and even the most recent works upon the subject incite the naval architect to aim always at approaching the form of least resistance. The investigations given in the paper show, however, that the adoption of a form of least resistance, or of small comparative resistance, may, in fact, lead to a lavish outlay upon our ships, and to a great sacrifice of efficiency; while, on the other hand, the adoption of a form of greater resistance would contribute in certain classes greater resistance would contribute in certain classes of ships to great economy and to superior efficiency.

of ships to great economy and to superior efficiency.

In order to indicate clearly, but approximately only, the purpose in view, the author first considers the hypothetical cases of a long and a shorter ship, both of which are prismatic in a vertical sense. The length of the long ship is seven times its breadth, and its horizontal sections consist of two triangles set base to base. The length of the short ship is set base to base. The length of the short ship is five times its breadth, the middle portion being parallel for two-fifths of the length, and the ends being wedge shaped. It is assumed also, that at a speed of 14 knots, the long ship will give a constant of 600, and the short ship a constant of 500 in the Admiralty formula:— Admiralty formula:—
Speed 3 × Mid. Section

being weightless.

Indicated horse power.

The draught of water is in each case 25ft., and the total depth 50ft.

It is taken

It is taken for granted, that the form of the long ship has been found satisfactory for a ship of such scantlings that we may consider her built of iron of an uniform thickness of 6in., the top and bottom

an uniform thickness.

Now let it be required to design a ship of equal speed, draught of water, and depth but of such increased scantlings (whether of hull proper or of armour) that the weight shall be equivalent to an uniform thickness of 12in. of iron, the top and bottom being weightless as before. First, the new ship has the proportions of the long ship given to her, and secondly those of the shorter ship. In each case the engines are supposed to develope seven times their nominal horse power, and to weight (with boilers, waters, &c.), 1 ton per nominal horse power. The coal supply in each case equals the weight of the engines, so that both ships will steam the same distance at the same speed. But as the equipment of the smaller ship will be less weighty than that of the larger ship, we will require the larger ship to carry 2,000 tons, and the smaller 1,500 tons additional weight.

Assuming the breadth extreme in each case to be

Assuming the breadth extreme in each case to be the unknown quantity, we can, from the Admiralty formula given above, deduce an expression for the indicated horse power; thence under the assumed

conditions the weights of engines and coals can be found; and these being added to the weights of hull (calculated on the assumption that the sides are of expression for the total displacement, in tons, of each ship. Another expression is found for this displacement by finding the weight of water displaced. The two expressions are equated, and a quadratic equation is formed, from which the breadth extreme is determined, and from it all the

other values can be found.

The accompanying table shows the results obtained by this method of the two classes of ships:—

	ĺ	Long Ship.	Shorter Ship.
Nominal horse power Indicated Weight of hull , engines , coals		\$81ft. 88 1,850 H.F. 9,450 " 12,570 tons. 1,350 " 2,000 " 17,270 "	342ft. 68j, 1,337 H.F. 9,359 7,576 tons. 1,337 1,500 11,750

It will, therefore, be seen that by adopting the proportions and form of the shorter ship, a ship of the required scantlings and speed will be obtained, on a length of 342ft., and a breadth of 68½ft.; whereas if the proportions of the long ship are adopted, the ship, although of the same scantlings and speed only, will require to be 581ft. long and 83ft. broad, the steam power in both cases being as nearly as possible the same.

cost. croad, the steam power is some cases soing as nearly as possible the same.

Considerations of this character, worked out more fully, led the designer of the "Bellerophon" to depart so considerably from the form and proportions of the "Minotaur."

The next part of the investigation is based upon the official reports of the measured mile trials of the "Minotaur" and "Bellerophon," when fully rigged, and upon calculations made from the drawings of those ships. It is assumed that a primmatic vessel having the same mean draught as each of these ships, those ships. It is assumed that a prismatic vessel having the same mean draught as each of these ships, and having the same form and dimensions as the mean horizontal section—which equals the mean displacement in cubic feet, divided by the mean draught of water—will give the same constant as the ship herself at the assumed speed of 14 knots, which, as nearly as possible, equals the speed obtained by both the "Minotaus" and the Bellerophon" on the measured mile. For each ship the weight of the armour and backing is supposed to be uniformly distributed over vertical prismatic sides of the dimensions of the armoured sides, and the weight of hull is similarly distributed over vertical prismatic sides of the dimensions below water of the mean horizontal section, and above water of the mean horizontal section, and above water of the mean horizontal section, and above water of the same constants of performance as the ships. The detailed calculations in the paper show that the weight per square foot of the material in the hulls of the two ships, when distributed over the sides of the representative prismatic vessels, is very nearly the same for both, and the same holds the sides of the representative prismatic vessels, is very nearly the same for both, and the same holds with respect to the weight per square food of armour and backing. The "Minotaur" is rather heavier in both respects, but for the reasons given in the paper, the means of the values found for the two shaps are en, and are found to be

armour and Weight per square foot of hull =11 ton. backing .

The questions next considered are these :- presuming it to be necessary to build another ship which shall also steam 14 knots, carry the same proportionshall also steam 14 knots, carry the same proportionate supply of coal to engine power, and proportionate quantities of stores, but shall have her armore and backing of double the weight of armore and backing of the "Bellerophon" and "Minotaum," then, first, what will be the size, engine power, and having the same mean draught and depth of armour; and, second, what will be the size, engine power, and having the same mean draught and depth of armour; and, second, of the "Bellerophon" type, and having her mean draught and depth of armour; this conclusion implying of course that the same constants of performance as draught and depth of armour? this condition implying of course that the same constants of performance as before will be realized in each case. On assessme of the great disproportion in size between the two types of ship, it is obvious that the smaller one will require much less weight of equipment. It is assumed, therefore, that the additional weights of the smaller ship (exclusive of engines, boilers, and coals), amount to 700 tons, and those of the larger ship to 1000 tons. The developed power of the engines, proportionate supply of coal, and the weight of engines, &c., are taken exactly the same as in the hypothetical case first given. first given.

By proceeding with the investigation for each case By proceeding with the investigation for each case in a way similar to that sketched for the hypothetical ships, only treating the breadth extreme of the mean horizontal sections of the new ships as the unknown, the following results are obtained:—The new ship of the "Minotaur" type which fulfills the required conditions will be nearly 490ft. long, 72 ft. breadth extreme, and have a total displacement of 14,253 tons, whilethe new ship of the "Bellerophon" 70,000 of the above-mentioned guns.

type is 380ft. long, 71ft. breadth extreme, and has type is scott long, the breadth extreme, and has a total displacement of 10,950 tons. It thus becomes obvious that a correction is needed in the weight per square foot of hull in the new ship of the "Minotaur" type, as her length has been so greatly hereased; it is considered that an increase of at Mereased; it is considered that an increase of at least 10 per cent, is required, and this is the allowance made. On the other hand, the new ship of the "Betterophon" type is still shorter than the "Minotaur" herself, and the displacement is not much greater than the actual displacement of the "Minotaur," so that so correction is needed in her weight per square foot of hull. When the correction has been made for the new ship of the "Minotaru" type, the final results in round numbers are as follows for the two classes of ship:—

	New ship of "Minotaur" type.	New ship of "Bellerophon" type.
Length Breadth Tonnage Nominal horse power Indicated Weight of hull " armout"	510ft. 75 ,, 13,770 tons 1,080 H.P. 7,560 ,, 7,100 tons 5,190 ,,	380ft. 71 ,, 8,620 tons 1,080 H.P. 7,560 ,, 4,460 tons 8,630 ,,
backing ) ,, engines and coals ,, stores carried Displacement	2,160 ,, 1,000 ,,	2,160 ,, 700 ,,

Taking the cost per ton at £55 (which is the average cost per ton of tonnage for the hulls of armour-clad ships), the saving made by adopting the new ship of the "Bellerophon" type would amount to £283,256, or considerably more than a

amount to £25,250, or considerably more than a quarter of a million sterling.

It must also be considered that the ship of the "Bellerophon" type would cost less for maintenance and repair, and be much handier in action.

(To be concluded in our next.)

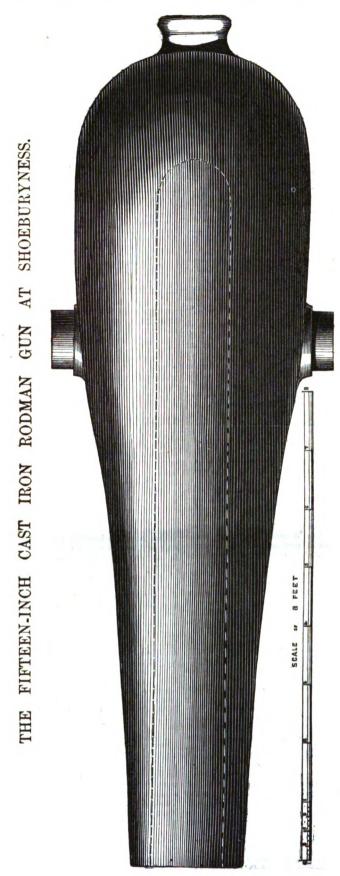
### EMIGRATION TO VICTORIA, AUSTRALIA

WE are glad to learn that the Government of Victorie is taking initiatory measures for the carrying out of emigration on a much more speedy, extensive, and comfortable plan than has hitherto been tried by ocean steamships of large size, registering not less than 2,500 tons, in which the accommodation and general management shall be far in been tried by eccen steamsnips of large size, registering not less than 2,500 tons, in which the accommodation and general management shall be far in advance of that in sailing ships. If the grand problem of bridging the distance between England and Australia in much less time, and at reasonable expense, can be accomplished, the disfavour with which Australia has been more or less viewed, when compared with Canada and the United States, will in a great measure be overcome, and will in all compared with Canada and the United States, will in a great measure be overcome, and will in all probability tend to a very large increase of emigration from Great Britain. In the settlement and opening up of a new country, great inconveniences are always found in the difficulty of communication between the town and country districts. This has to a great extent been overcome in Victoria, by the formation extent been overcome in victoria, by the formation of railways; existing lines will in process of time be largely supplemented by others, and we understand that tenders will soon be invited both in England and the Colony for railway works of considerable magnitude, from Melbourne to Belvoir on the River Murray, the estimated cost of which will be £2,100,000. To artizens and working men about emigrating, we have good authority for stating that ample employment may be looked for, for some long time to come, in the Colomy of Victoria.

### LAUNCE OF A CORVETTE FOR JAPAN.

ON the 77th ult. there was launched from the yard of Messwa. Hall Abordes Messes. Hall, Aberdeen, a large steam corvette, an order from the Japanese Government. The vessel is sane specimen of workmanship, and greatly wessel is An especimen of workmanship, and greatly admired for compact strength and beauty of outline. The corvette, which was christened the "Ibo-Sho-Mara" (the Whirlwind), is of 1,500 tons register, with engines of 250-horse power, measures 210ft. keel, 28ft. beam, and has a depth of 29ft. from the mapper and 21ft. from the main deck. The "Iho-Sho-Mara" is to carry ten guns of large calibre, and is constructed after the model of a first-class British. man-of-war. The vessel is built of British oak and teak; will be full ship rigged, and is intended to sail under steam and canvas combined, or either singly. The upper deck is laid on iron diagonals for lightness, while between wind and water for a depth of 4½ ft. the corvette is to be iron-plated 4½ in. thick, this shield being backed by 6in. of teak. The corvette, which is to be commanded in the first place by Captain James and Lieutenant Inglebach, has been built at an expense of some £65,000.





THE RODMAN GUN.

SINCE the appearance of our article on "American Ordnance," which appeared in the MECHANICS' MAGAZINE, of the 25th ult., a desire has been expressed that we should give a description of the Rodman Gun at Shooburyness. We therefore annex a sealed engraving to which the following particulars refer. The dimensions of the gun are:—Extreme length, 176in, or 14ft. 8in.; length of bore, 12ft. 2in.: greatest diameter at breech, 48in.; minimum at muzzle, 23 in. Weight of solid shot, 450 lb. The ordinary service charge is 35 lb. of powder, and 50 lb. charges may be used

occasionally at long ranges, The official instructions issued to captains of ships state that when attacking ironclads 60 lb. charges may be used for not more than twenty rounds. Licutenant Rodman's system of casting guns consists simply in passing a stream of water through the core in order that the interior of the gun may be cooled as fast, or a little faster, than tee outside, and so initial strains are prevented. The core is an iron tube coated with loam. The quantity of water passed through in casting an 8in. gun is about ten gallons per minute for a period of twenty hours. After melting, the iron is usually allowed to remain for some time in a state of fusion; air furnaces are

almost always used. The cast iron is of great excellence, the test of tensile strength prescribed by the Government is 30,000 lb. per square inch, a variation of 2500 lb. each way being allowed. The proof of the smaller guns is, that one gun taken at random from the whole order shall stand 1000 rounds with service charges, guns 13in. bore and up must stand 500 rounds; but although this seems a severe test, it must be borne in mind that the service charge is small, only 35 lb., and English artillerists generally maintain taat American powder is weaker than ours, which is certainly stronger than any used by continental nations.

ON THE METHODS EMPLOYED IN DE-TERMINING THE COMMERCIAL VALUE AND THE PURITY OF COAL GAS.

BY MR. F. W. HARTLEY. (Concluded from page 264.)

Sulphuretted Hydrogen and Ammonia.

In the Metropolis Gas Act of 1860, it was enacted that the "gas shall, with respect to its purity, be so far free from ammonia and sulphuretted hydrogen that it shall not discolour either turmeric paper or paper imbued with acetate or carbonate of lead, when those tests are exposed to a current of gas issuing for one minute under a pressure of 5-10ths of an inch of water." In respect to these tests, it will be sufficient to say that their efficiency depends upon the delicacy of the test papers. Those used by gas analysts and by gas companies are of the best kind. It is quite certain that a good turmeric paper can be rarely exposed, for a few seconds only, to a current of coal gas without becoming somewhat discoloured, a circumstance which should excite little surprise when it is remembered how difficultit is to free gas entirely from ammonia, and that so small a quantity as one grain in 100 cubic feet of gas is said to be sufficient to affect a turmeric test. The gas referees say that the gas shall be considered impure, rendering the company issuing it liable to the penalties described in the Act of 1868 when it contains more than 5 grains of ammonia per 100 cubic feet, or when it contains the least trace of sulphuretted hydrogen, and they have directed that all the gas consumed in testing for illuminating power shall be passed through an apparatus in which slips of bibulous paper, impregnated with acetate of lead, are suspended in a damp state. As the author understands the instructions, the exposure of the papers would be for about three hours; the test for sulphuretted hydrogen would therefore be very efficient.

In respect to ammonia, the test is to be a continuous one during a period of nearly twenty-four hours. Two test solutions are to be used, one of dilute sulphuric acid of such strength that ten measures of it will neutralize one grain of ammonia. The other of a solution of ammonia, 100 measures to contain one grain of ammonia. The mode of testing is as follows:—Two glass cylinders, of about 1 in. diameter, are filled with pieces of broken glass or with glass beads. A quantity of ammonia likely to be in the gas, is taken, and one-half is poured into each cylinder. The cylinders are then connected together, and gas is passed through both at the rate of not less than 75 of a cubic foot per hour. The ammonia will be arrested by the acid, and a quantity of the acid will be neutralized. The gas is measured by a wet meter after it has passed through the cylinders, in order to avoid the possible absorption of ammonia by the water in the meter. The gas then passes on to the sulphur test hereinafter described.

At the end of about the twenty-third hour thegas current is stoured. The cylinders are well.

At the end of about the twenty-third hour the gas current is stopped. The cylinders are well washed out with distilled water, and the washings collected in a glass vessel. One-half is put into a labelled bottle and set aside for a week. One-fifth of the remaining portion is taken, and a few drops of the solution of hematine added to give a brown colour. A graduated alkalimeter or burette is filled with test ammonia solution, which is dropped slowly into the portion of fluid to be tested until the colour of the mixture changes to pink, the admixture of the liquids being facilitated by stirring. The quantity of acid unacted upon by the ammonia is thus found. At the rate of '75 of a cubic foot per hour, the quantity passed in twenty-three hours will be 17.25 cubic feet, and as the gas is to contain no more than 5 grains per 100 cubic feet, the maximum quantity for 17.25 cubic feet should be no more than 8625 parts of a grain. Ten parts of acid will neutralize 1 grain of ammonia, and there

fore 20 parts of acid would be amply in excess. If 20 parts of acid be used, the whole of the washings be operated upon, and it be found that 135 parts of the alkaline solution (100 parts of which contain 1 grain of ammonia) be required to complete the neutralization of the solid it would be shown that 65 parts. tion of the acid, it would be shown that 65 parts of a grain of ammonia had been absorbed from the of a grain of ammonia had been absorbed from the gas by the acid, and the quantity of ammonia in 100 cubic feet of gas would be 3.188 grains:—17.25 : 100 : : .65 : 3.188.

As, by the instructions, one-tenth part only of the washings is operated upon, the quantity of ammonia solution actually employed to give a similar result would be only 13.5 parts.

Sulphur .- Coal gas, however carefully purified according to the present known methods, contains bisulphide of carbon, and possibly some other compounds of sulphur, whose composition is uncertain or unknown. The determination of the quantity of sulphur contained in purified gas is surrounded with difficulty and uncertainty. It is not found practicable to determine the percentage of sulphur impurities by any direct analytical process. The first part of the usual method of analysis consists in burning the gas, the resulting products being carefully collected. During the combustion of coal gas, sulphuric and sulphurous acids are produced, and the latter acid, there is no doubt, in by far the largest quantity.

The great difficulty in the way of quantitative analysis lies in oxidizing the sulphurous acid into sulphuric acid, and some uncertainty exists as to the extent to which the result of the analysis may be depended upon, owing to the absence of any positive knowledge whether the oxidizing of the positive knowledge whether the oxidizing of the sulphurous acid has been complete, or to what extent it has been partially effected. The first sulphur test was produced by the late Mr. Alexander Wright in the year 1851. It consisted of a Liebig's condenser in which a small jet of gas was burned, the air with which the jet was supplied being charged continuously with vapour of ammonia. The products of combustion—carbonic acid, sulphurous and sulphuric acids—together with ammonia vapour, nitrogen, and an excess of with ammonia vapour, nitrogen, and an excess of air passed through the instrument; and it was supposed that the sulphur acids were completely arrested, and, in combination with ammonia, thrown down with the condensed water resulting

from the burning gas. This instrument was first used with a stream of ice-cold water passing through the condenser, the maximum condensation being thus effected; but it was found, after an extended experience, that the largest quantity of sulphur was never exhibited when the largest quantity of condensed water was obtained. The question of sulphur in gas was not then considered so important as it is at the present time, and no extended experiments were made to fix the conditions under which the greatest quantity of sulphur could be made apparent. It may be supposed that, when the Act of 1860 was passed, and the degree of sulphur impurities was fixed at 20 grains per 100 cubic feet, the opinion was that Wright's and similar tests afforded, as they were then used, the means of arriving at the total quantity of sulphur in gas; such opinion was erroneous. The testing process such opinion was erroneous. The testing process for sulphur became more refined, and gas com-panies have had to struggle most carnestly, and under grave difficulties, to meet the conditions imposed. Fortunately, their efforts have been tolerably successful, although, doubtless, the cost for purification has been largely increased.

Dr. Letheby produced his sulphur test in 1853. or 1854. It consists, as now made, of a cylindrical glass condenser, with hemispherical ends, each end having an open neck, 2in. diameter and 2in. long. The condenser is 4 in. diameter and 13in. long, and is raised by a stand about 20in. above a table or shelf. A trumpet-shaped glass tube, 3in. wide at the base and 3in. wide at the top, where it is bent at a right angle, is fitted, by means of a sound cork, into one of the necks of the cylinder, and hangs with the wide end downwards. Fin. diameter, and about 4ft. long, is fitted with a cork into the other neck of the cylinder, and a cork into the other neck of the cylinder, and projects upwards. A Leslie argand gas-burner is placed below the trumpet, and below that a bottle containing a quantity of the strongest liquor ammonia. This bottle is covered by an inverted glass funnel, fitted with a tin tube, which passes upwards, through the centre of the burner, to about lin. above the jet-holes, so that the products of combustion carry with them into the condenser a large quantity of ammonia vapour.

When instruments of this kind were first

sent to preserve in each a perfect equality in the dimensions of the various parts. Nor were any precise conditions laid down as to the tem-perature of the operating rooms, the rate of consumption for the gas, &c. It was found, however, that such conditions exercised considerable difference in the results. The same gas burned at the same rate, in instruments of different dimensions, yielded unequal quantities of sulphur in the analysis, and the same effect arises, when gas is burned at different rates, in the same instrument. These variations are due, no doubt, to the different temperatures produced in the cylinder, and the degree to which the sulphurous acid is oxidized and combined with ammonia. It is not probable that with any instrument of this character, the whole of the sulphur in gas will be determined, but this is of stilphur in gas will be determined that if uni-little consequence in a commercial test, if unipurified to the highest degree which chemistry, combined with practical experience, show to be possible, it matters little whether the test exhibits the whole or part only of the impurity, providing the test be reliable and uniform in its indications.

The gas referees have resolved that Dr. Letheby's apparatus shall be used. At present they fix no standard for sulphur impurity, but simply direct that tests shall be made and recorded, with a view, it may be supposed, to establish data on which to found a standard of purity. The gas is to be tested in a room where no gas is burned other than that which is being tested for sulphur and ammonia, and to secure greater accuracy, two sets of apparatus are to be used simultaneously, the average of the results so obtained is to be held to show the amount of sulphur contained in the gas. The gas is to be burned at the rate of 75 of a cubic foot per hour during a period of nearly twenty-four hours, when the combus-tion is to be stopped simultaneously in both sets of apparatus, the condensers emptied, and they and the tubes well washed with distilled water, the washings being added to the con-densed liquor from the condenser. The two sets of apparatus are then to be immediately put to work again.

The further operations with the condensed liquor and the washings from each apparatus are as follows, and are practically the same as have been adopted for some years past:—One half of the liquid is put into a labelled bottle and set aside for a week, in case it is necessary to repeat the analysis. The other half is boiled in a glass vessel for ten minutes, and is then treated with an excess of muriatic acid. An excess of a solution of chloride of barium is next added, and the solution again boiled for half an hour. When cold, the liquor is filtered, and the sulphate of baryta When cold which has been formed is collected on the filter paper. This is next well washed with boiling distilled water, to free it from muriate of ammonia or baryta. Sufficient washing is evidenced when a little of the liquor from the filter taken in a test tube remains clear on the addition of a drop of a solution in distilled water of nitrate of silver.

The filter paper and its contents are carefully dried and then placed in a platinum crucible and burned over a Bunsen burner to a white ash. 117 parts sulphate of baryta contain 16 parts of sulphur, and, therefore, if 27 grains of sulphate result from the combustion of 18 cubic feet of gas, the quan-tity of sulphur due to 100 cubic feet would be 20.5 grains, for 18:100::27:150, and 117:16::150:20.5. The volume of the gas used in testing for ammonia and sulphur is also to be corrected for temperature and barometric pressure, the temperature and pressure being noted at the commencement and at the end of an experiment, and the mean being taken.

The foregoing completes the exposition of methods by which the commercial value and purity of gas is determined, and the author believes that there is no country in the world in which gas is subject to such rigid supervision and severe analysis as in England. If consumers only realized this, it is possible that, instead of so often finding fault in respect to deficiency of light, sootiness of gas, &c., they would turn to their burners and fittings in the expectation that they would there find the causes of dissatisfaction. Competent gasfitters should be contracted with to look after burners and fittings in the same way that makers of measures are to look after scales and weights, &c.

The author then referred to the imperfections When instruments of this kind were first which had been mentioned as belonging to the made, the same care was not taken as at pre- present system of gas testing, and spoke of the

jet photometer, which had been proposed as a measurer of illuminating power. It was described as a delicate mechanical pressure gauge, capable of indicating to the 100th of an inch water pressure, to which was attached a steatite jet. gas was burned from the jet at a constant pressure, and the value of the instrument depended on a thoroughly established fact, viz., that the length of a jet flame burning under a constant pressure, varied with the quality of the gas. He admitted the correctness of the principle and the value of the instrument to gas makers, but on several grounds objected to the jet photometer as a measurer of the commercial value of gas. cations would have no significance to the public, while the present system of photometry is quite significant, whether the standard of light be a candle or a lamp. He next mentioned Mr. Valentin's sulphur test, with which there were good reasons to suppose that all the sulphur in gas converted into sulphuric acid. It consisted of a tube of platinum, charged partly with spongy platinum and partly with soda lime; this tube was made and kept red hot in a gas combustion furnace, while gas and air in due proportion to ensure complete combustion (which was evidenced by two circumstances) were drawn through. The mixture passed first through the spongy platinum, and the gas was completely burned; the products then passed through the soda lime, which com-pletely absorbed the sulphuric acid. When sufficient gas for an experiment had been burned, the soda lime was removed from the tube, and dissolved in dilute hydrochloric acid. The after processes were similar to those already described under sulphur analysis. The only objections to this sulphur test were the necessity for using an aspirator and

for increased delicacy in manipulation.

The author next described the analytical processes practised by gas makers, which comprise the employment of the apparatus described in the foregoing part of the paper, of specific gravity tests, and of the endiometer, by which last the amount of sulphuretted hydrogen and of carbonic acid in crude gas, and the amount of carbonic acid, carbonic oxide and hydrocarbons (or lightgiving compounds), in purified gas, is in each case determined.

We would direct attention to the following errata which crept into our notice of Mr Hartley's paper last week. At page 263, under the head of "Batwing Burners," the width of slit of No. 7 should be '013in., not '313in. On the same page, last paragraph on third column, six lines down, read, "The candles are next lighted, with special precautions to preserve the wick well formed. They are, &c.

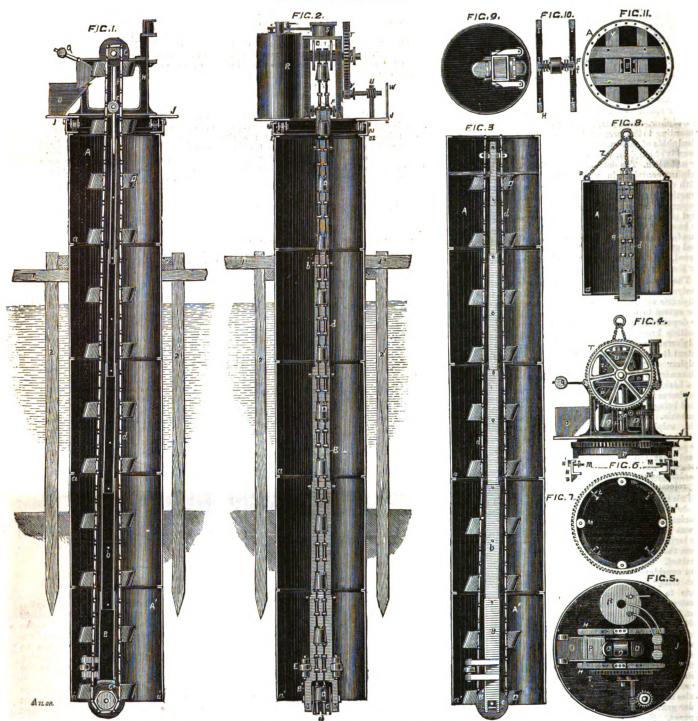
### THE ROTATORY DREDGER.

THE extensive use now made of cast-iron cylinders filled with converte to the converte of the of piers of bridges, &c., is every day adding to the importance of the subject of economical and expeditious modes of sinking them. There can be no doubt that if they could be sunk by excavating the interior with a similar dispatch to, and at the same cost as, ordinary dredging, that plan would be almost invariably adopted in subaqueous foundations where sand or clay has to be penetrated. The method usually employed is to convert the cylinder or caisson into a huge diving bell, with air locks for passing workmen and material from the bottom, where the excavation is effected by manual labour. The process, however, is tedious in the extreme, something like 5ft. or 6ft. deep per day, and the plant required is of a complex and costly character. Other experiments have been tried with more or less success where sand only has to be removed, but where either stones or tree roots, or even stiff material, have to be dug out, they have mostly failed. For this purpose there is no machinery more effective than dredging buckets, which do all that pick and shovel are capable of doing, and at a wonderfully reduced They have, as yet, however, been applied to a very limited extent to the sinking of cylinders, and with only a partial success, attributable to the inadequate state and defective arrangement of the apparatus usually improvised for this purpose. The machinery being carried on fixed staging independently of the cylinder, requires to be con-tinually lengthened while the sinking is proceed-ing, and, being fixed in one position, does not remove stones or other obstructions which it cannot reach. A hole is made in the centre, producing an occasional avalanche of sand which blocks up or breaks the machinery.

To overcome all the drawbacks we have enumer-

### ROTATORY DREDGING MACHINE.

BY MR. DAVID ELDER.



ated, and to meet the requirements of the case, Mr. David Elder, of Newcastle-on-Tyne, has recently designed and patented the rotatory dredger which forms the subject of the accompanying engraving. This arrangement consists of a portable steam rotatory dredger, which is placed on top of the cylinder to be sunk, with a telescopic ladder to facilitate lengthening the bucket chain when a length of cylinder has to be added. The buckets dig from the circumference to the centre all round, effectually removing every obstacle to the descent from the cutting edge of the cylinder. Six-horse power, raising 10 cubic feet per minute, would sink ordinary cylinders at the rate of 10ft. deep per hour. Dredging on a large scale costs 1\frac{3}{4}d. per ton. For this purpose it should not exceed 6d. or some merely nominal sum as compared with the ordinary cost of such operations. The time required has hitherto been a much more serious obstacle to the general adoption of concreted cast-iron cylinders for the foundations of bridge piers, and especially of river walls, than the mere cost of sinking them, and it is chiefly in the saving of time that Mr. Elder's apparatus appears to such advantage.

In our engraving, fig. 1 is a sectional elevation of a foundation cylinder A, bucket ladder B, tumblers C C 1, turntable J, and shoots P and O (one side frame of the machine being removed for the purpose of showing the buckets D, &c.) The cylinders A are furnished with an internal flange a at each end for forming the joints, and which are further utilized for carrying or fixing the machine at the top and for carrying extra loads in the form of annular segments of iron, which may be necessary to impose to effect the sinking operation. The lowest cylinder A 1 has a cutting edge a 1 at bottom. The bucket ladder B is formed in lengths corresponding to those of the cylinder, and is rectangular in cross section for the purpose of taking the torsion strain off the junction pins, and the lengths are made to fit into each other internally and externally or telescopically, so as to enable them to be jointed together at the required length. They are united by pins or bolts passing through holes at convenient intervals for adjusting the length. The lower end of the bucket ladder  $\{i\}$  is bifurcated in form, as shown at B 1 in fig. 2, for carrying the two bearings of lower tumbler C 1; it has also east or fitted on it double bearings

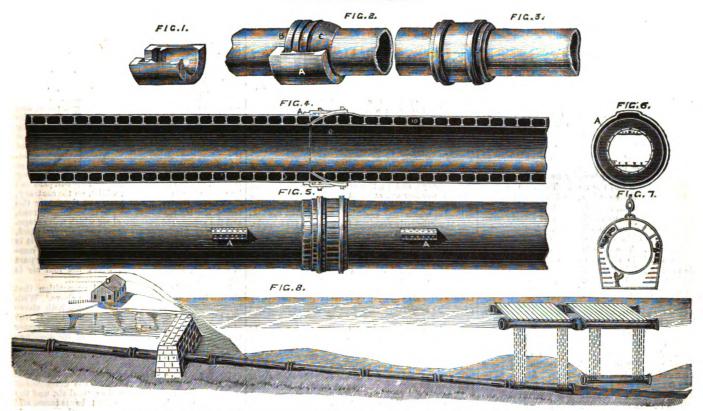
e for carrying the guide rollers E. The upper end of the bucket ladder is formed with an eye, through which is passed the crosshead F. The crosshead is guided in slots f in the side frames of the machine, and is free to rise and fall; the crosshead and eye piece is removed with the machine when the ladder has to be lengthened; it is made to fit the various widths of ladder by introducing suitable slips of iron.

is made to fit the various widths of ladder by introducing suitable slips of iron.

The tumblers C C ¹, buckets D, and links d, are of the ordinary construction. The upper tumbler shaft c has two barrels G G ¹, formed on it, recessed for receiving pitch chains for hoisting the ladder, &c. It is carried on the side frames H of the machine, and driven by a disengaging clutch J, as shown in fig. 2. The side frames H are fitted and bolted to an annular sole plate J, and carry the engine and bearings of the gearing. The sole plate has two annular feathers K K which carry the perpendicular bearing rollers L and the horizontal guide rollers M. These rollers bear upon the internal bottom flange m and side of the foundation plate N, sustaining the weight and guiding the rotation of the machine. The foundation plate N is formed to fit the top of the cylinder

#### TUBE JOINT A N DSUBMARINE TUNNEL.

BY MR. C. MARSDEN.



**A, and** is fixed temporarily on the top flange a of the cylinder. It is furnished with guide brackets the cylinder. It is furnished with guide brackets n on the bottom to facilitate the placing on the cylinder, and a toothed circumference N 1 on the top for the turning gear. It has also an internal flange n 1 on the top, so as to be lifted with the machine by the guide rollers L or horizontal pins l, projecting for the purpose when the machinery is being removed. The delivery shoot O is fixed to sole plate, and is furnished with a door to discharge at intervals. The movable shoot P is hung on a pivot or shaft, allowing it to oscillate, and kept inclined to the bucket chain by counterbalance weights Q, so as to save the material raised, and allow it to yield to the pressure of the buckets and allow it to yield to the pressure of the buckets when passing.

Fig. 2 is a sectional elevation at right angles

Fig. 2 is a sectional elevation at right angles to fig. 1, showing the actuating machinery, consisting of the boiler R, the engine S, the main driving wheel T, and the turning gear U. The turning gear is driven by a disengaging clutch V, and is supported by bearing fixed on side frames H, and sole plate J; a hand rail W surrounds the sole plate. Fig. 3 is an elevation of the bucket ladder B, with the machine removed for the purpose of lengthening the cylinder A. The links are detached, by the withdrawal of the pins at the top and the chain d is secured by being hung to the and the chain d is secured by being hung to the ladder by passing cotters X through holes made in the ladder for that purpose. When the chain is detached, the ladder is allowed to rest on the ground at the bottom, and is kept in position at the top by a temporary platform Y supported by brackets, and bearing on the side of the cylinder; this platform is also utilized for conveniently bolt-

this platform is also utilized for conveniently bolting and making the joints of the cylinder. Fig. 4 is an elevation of the machine as being removed, showing the mode of slinging. The chain slings Z are hooked to eye bolts  $z^1$  in the side frames. Fig. 5 is a plan of the last figure. Fig. 6 is a vertical section of the foundation plate N, showing the toothed surface  $N^1$ , guide rollers M, showing the toothed surface  $N^1$ , guide rollers M, showing the toothed surface  $N^1$ , guide rollers M, showing the toothed surface  $N^1$ , guide rollers M, showing the toothed surface  $N^1$ , guide rollers M, showing the toothed surface  $N^1$ , guide rollers M, showing the state M and lifting showing the toothed surface N 1, guide rollers M, lower flange m, guiding flange n, and lifting flange n. Fig. 7 is a plan of fig. 6, showing guide and bearing rollers M and L, toothed rim to sole plate N 1, bearing flange m, and upper flange n. Fig. 8 is a sectional elevation of a cylinder showing the mode of slinging and of lengthening the bucket ladder and chain. The links d are secured to the ladder B by cotters X and the ladder hooked by the chain Z, the same sling serving for the cylinders and the machine. Fig. 9 is a plan of cylinder A, at cutting edge a 1, showing cross section of lower end of ladder B, buckets D, friction rollers E, bearers e, and links d. Fig. 10 Fig. 8 is a sectional elevation of a cylinder showing the mode of slinging and of lengthening the bucket ladder and chain. The links d are secured to the ladder B by cotters X and the ladder hooked by the chain Z, the same sling serving for the cylinders and the machine. Fig. 9 is a plan of cylinder A, at cutting edge a 1, showing cross section of lower end of ladder B, buckets D, friction rollers E, bearers e, and links d. Fig. 10

is a sectional plan of side frames H, showing cross-head F and guides f. Fig. 11 is a plan of top of cylinder, showing flanges a, cross section of top of ladder B, kept in position by the temporary wooden platform Y.

wooden platform Y.

In operation, the cylinders to be sunk are guided by a frame 1 1¹, and guide piles 2 2¹, in the usual manner, but any bias from the vertical is counteracted by disengaging the turning gear, and digging from one side, the resistance of the ground deflecting the bucket ladder towards the side of the cylinder until it bears on it by the guide rollers E, insures the removal of the earth from the cutting edge a¹ of the lower cylinder A¹, and the rotation completes the entire excavation from the periphery to the centre. Should the buckets meet with any unusual obstruction, the chain raises the ladder until they are free, should the buckets meet with any unusual obstruc-tion, the chain raises the ladder until they are free, or should they get jammed, the ladder can be raised by the hoisting barrels and chains. The engines are fitted with back and forward valve gear, driving the dredging and turning gear either together or separately, and the boiler is supplied with water by a steam pump with suction hose to the water in the interior of the cylinder, or to a tank supplied by the dredging buckets. The cylinders and the machine are lifted off or put in their places by a travelling crane overhead on a fixed staging, in the usual manner, or in tidal waters the lifting and removal may be conveniently done from an overhanging stage on a floating barge similar to what is ordinarily used for diving bells, which need only be of sufficient height to put on a cylinder at low water and the machine at

high water.
When the apparatus is applied to raising earth vertically from shafts, wells, and other similar excavations, the turntable with the machine and apparatus is placed over the proposed excavation, and the work proceeds in a similar manner to that previously described for sinking cylinders. When the dredger is employed for raising earth for docks, canals, cuts, and similar excavations, the upper end of the ladder is attached to a turntable to enable the machine to turn to accommodate the horizontal angle of the ladder. The turntable is on a truck placed on a railway laid alongside the

machine. When not under water, the suspending chains are fixed similarly to the mooring chains The truck may also be made to travel on its rails by driving the wheels as in a travelling crane, or by heaving on a mooring chain. In order to strengthen the beam or ladder, Mr. Elder sometimes applies a truss on the under side. The buckets are discharged into waggons placed on a railway. The buckets, links, ladder, and turn-tables are all of the ordinary construction, but the apparatus is carried on a platform carrying also the engine and boiler, driving and hoisting gear, fixed on a turntable similar to the apparatus described for sinking cylinders. The apparatus is not required to rotate completely, but move in an arc sufficient to accommodate the ladder to the slope of the work.

#### MARSDEN'S TUBE JOINT AND TUNNEL SCHEME.

IN the annexed engraving we illustrate a very important improvement in making the joints of gas or water pipes tight, and at the same time flexible. It is the patented invention of Mr. Charles Marsden, of 224, Kingsland-road, London, who has also worked out a scheme for connecting England and France, by means of a tunnel, jointed on his principle. We will first describe the simple pipe joint, as illustrated in figs. 1, 2, and 3 of our engraving, and afterwards proceed to notice the proposed tunnel. Mr. Marsden's plan is to have a flange on one end of each length of pipe, upon which circular projections are formed. The opposite end of each length is also made with a bulge or protuberance on the exterior, which has bulge or protuberance on the exterior, which has circular projections, similar to those on the other end. The spaces between the projections are filled in with packing, and the ends of the pipes are brought together, the end of one just fitting into that of the other. The ends are then connected, by being enclosed within a ring or socket, formed by the context which are formed about the context of the contex in two parts, which are firmly held together by rings and screws. The inner edge of the end of one pipe is chamfered, and the outer edge of the end of the other is made to fit inside the chamfer, so that a ball and socket action is secured, and the pipes will follow any undulation caused by a settlement of the ground in which they are laid. Fig. 1 represents a half socket, which is seen in place at A, fig. 2. In the latter figure, B is the flange with the furrow to receive the packing, C being the circular projection or ball, with a similar furrow. Fig. 3 shows the joint completed by the addition of the outer rings.

Turning to the tunnel scheme, we have the same principle, differently carried out in detail, to meet the requirements of the case. This principle is also that which Mr. Marsden adopts for pipes of large diameter. It consists in fitting one end of the pipe with a series of stepped or curved plates, which are secured in place by sorows or rivele The adjoining end of the next pipe is fitted with a bulge or socket. Another series of plates is employed, one end of which is forced under the open end of the stepped plates. They are plates vented from falling out, by being guided into position by a number of rings, fitted on the end of the pipe. Another ring is employed on the outside, to hold the places. A portion of this ring is looped or predicted, to enable the place of Be placed in position. When passed the place is position, when passed the place is successive, so as to meet each other, until the whole diameter of the print end is covered. They are then firmly sectioned in place, by keys being driven in between them said the ring. The loop is then filled in with a wedge piece, and thus the whole joint is made sound, flexible, and tights.

The method of construction will be alearly seen Another ring is employed on the outside,

The method of construction will be clearly se from our engravings, in which fig. 4 is a scotlonal view of the ends of two lengths of sales showing the joint. The tube is built of scotle sales, and has a double skin, on the well-known state, and has a double skin, on the well-known state, and has a double skin, on the well-known state, and has a double skin, on the well-known state, and has a double skin, on the well-known state, and the sales should be sal rilled in with artificial stone. Fig. 5 is an exterior view of the joint, with the plates and rings in position. Fig. 6 is an end view of the tunnel, constructed with joints, as in figs. 4 and 5. In this view, it is seen how Mr. Manadem proposes to carry pipes for ventilating the tunnel, as well as pipes for water, sewage, and telegraph wires, at the top of the tunnel. At the bottom runs the line of road, on which the railway is laid. The ventilating pipes are formed with longitudinal slots. Air is to be forced from the short and into these tubes, which will pass through the stoke into the tumiel, and ventilate it. In this figure, A is the clip ring to which we have already made reference. Bracings are provided at A, fig. 5, which are to receive the blocks and falls for lowering the lengths of tubing into position in constructing the tunnel. Fig. 7 is a credle for the divers to work in, when making good the joints of the tubes, which are to be caulted with asphalte. Fig. 8 shows generally the method of laying the proposed tunnel according to Mr. Marsden's design, and which we shall near proceed to describe.

A cutting is first to be made on land about two or three miles in length, gradually descending to a point where the water is about 10 fathoms deep. A see wall is to be built about 50ft, from the wa euge. A portion of a cylinder is to be built in the wall and made watertight, and the sea is then to be allowed to flow up to the wall, so that the next cylinder can be floated and placed in a proper line. The same with the next and so an allowed. edge. A portion of a cylinder is to be built in the he same with the next, and so on, lo from a raft which they will form. Mr. Marsden proposes that divers should cut through moderately high projections in the Channel bed, and also the levels, making a trough, into which would be lowered clay, the divers puddling the same, and thus forming d for tubes to rest upon. The cylinders can b made on the coast, and, when finished, have their ends stopped, and be towed to the spot required, with the artificial stone composition. Four or six of the tubes can be used to form a raft or stage to carry the machinery for lowering and fixing the tubes in place, and afterwards can be used on the land end to finish the connection on shore. By this means, Mr. Marsden estimates a working tunnel could be completed in about four years, without the danger of its being flooded.

The heading at each end is to be made in three

or more parts, and well secured with india-rubber, or other packing, and screw bolts. The heading after two or three cylinders are fixed together from the outside, is to be removed from the inside, making an entrance from the shore end into the next tabe and so on throughout. The double cylinder is braced to keep the inner from the dusty. The praced to keep the inner from the outer. The space between the two, which is bit. of fill, is to be filled with tarred granite and asphalts, which will form a perfect wall. As Mr. Marsden considers it impossible to have a ventilating shart in the Channel, he proposes to have machinery on each shore to abstract the vapours from, and also to force air into, the tunnel. Mr. Marsden's estimate for a tunnel between England and France on his principle is £12,260,000.

FAIR supplies of new potations have their London from Scilly within the last few days.

ON VENTILATION.\* By Dr. Edward Smith, F.R.S. PART II .- MODES OF VENTILATION. (Continued from page 244.)

(Continued from page 244.)

(UCH is a short reference to some of the more in ordinary and important principles involved, and I now protect to offer a few observations of enthing methods of ventilation. The ordinary method, every thing from the first of the protection of the degree is which there are expensive.

The objections to this plan are:

1. The attention of some person is required to regulate the openings according to the degree of ventilation required; and as this cannot be the chief

regulate the openings according to the degree of ventilation required; and as this cannot be the chief duty of a particular person, whether is a private of a particular person, whether is a private of a particular person for the duty with a particular knowledge and particulars; the result is either too fittle of too much remiliation.

2. In the summer time, when ventilation is required but fire is not weated, it is very usual to close up the chimneys, and particularly those of bedrooms. In cold weather and at night all doors and windows In cold weather and at night all doors and windows are closed, and they act as ventilators only in the degree in which they are ill-fitting, whilst ventilation is particularly required in bedrooms at night, and the use of gas in the long winter evenings calls for good weatherness in sitting rooms.

Such as a requirement chance by otherwise that discourse, jet it has not been objected to even in some hospitals, for during a late discourse on this subject it was gravely affirmed that the ventilation in workhouses must be defective, because workhouses

in workhouses must be defective, because workhouse nurses were said to be less reliable than those of a particular hospital in reference to the opening and

closing of the windows. Many devices have been adopted with a view to ventilate by windows. Some have the double-hung sashes by which air may be admitted at the highest sashes by which air may be admitted at the highest and lowest parts, and in a degree in the middle ateo, in such proportion as may be desired, and the believe, the best construction at present known; provided the window extends so near to the ceiling that, when the upper sash is drawn down but a little, the entering air may be so far above the bed, or above the head of the immates, that the current may not be injurious. It is, therefore, inapplicable as the sole means of daily ventilation to low rooms, viz., to rooms less than 10ft. in height. Some windows have the upper portion to fall inwards, with a view to direct the current of air upwards, and it is held in that position by a cord, or by falling into a hopper with the sides of the V-shaped space closed or open. Such a ventilator admits too large a volume of air in one place in cold weather, and in order that it may Such a ventilator admits too large a volume of air in one place in cold weather, and in order that it may be safely used, the room must be of great height, as, for example, 14ft, and upwards, but even then it causes discomfort, since the current of cold air eventually falls, and the room becomes cold, unless other meens of warmth are provided than open fireplaces. I have, however, seen this plan in operation in windows within 3ft of the head of the sleeper, but windows within 570. Of the head of the sleeper, but in such places the natural remedy was applied, vis., to shut them, except when kept open in the presence of superior authority. Others have the lower half of the window to fall forward into a hopper, and the evils just mentioned are intensified; whilst a more modern, but scarcely better, invention divides the window into four of more parts, each or all of which may be opened at pleasure, and fails for the like

A very frequent contrivance in the old iron window frames is to provide a special portion in the centre or upper part of the window which may be opened inwards, outwards, or laterally, or fall inwards into a hopper. Such openings are always placed too far below the ceiling, but the quantity of air admitted in one place is smaller than where the opening extends across the whole sash, and they are only so far less injurious. The old lattice window, which opens by hinges on its side, is in like miniter unfitted for the purpose of ventilation, except in conditions where a large volume of air could be silmitted without injury. A very frequent contrivance in the old iron window

without injury.
These evils having been appreciated, ventilation has been effected by placing perforated zinc or perforated glass panes in some parts of the windows, or a strip of perforated zinc has been placed across the

rated glass panes in some parts of the windows, or a strip of perforated zinc has been placed across the top of the window frame, to act when the upper sach its drawn down, and where the windows have been high, and the ventilisting panes have occupied the highest cityation, the plan has from very virtuable, and the ventilisting panes have occupied the highest cityation, the plan has from very virtuable, which the principle is that of a ventilistor, said not of a windows properly so called, are forther in the ceiling, and companies of vertical air wherever placed, and with the ventilistors properly so called, are forther in the ceiling, and companies of vertical with the ceiling, and companies of vertical with the ceiling, and companies of vertical with the external air by external gratings, with or without special channels, or simply by the stockential openings in the roof. The principle involved in their use is that the foul air ascends, and stockential openings in the roof. The principle involved in their use is that the foul air ascends, and stockential openings in the roof. The principle involved in their use is that the foul air ascends, and stockential openings in the roof. The principle involved in their use is that the foul air ascends, and stockential the control of the vertical openings, and when not defended they will admit all all the control of the wind. When not defended in the stockential within the found whether are in proportion to the size of the opening and the found with the control of the wind. When not defended in the first and direction of the wind. When not defended in the first and direction of the wind. When not defended in the first and direction of the wind. When not defended in the first and direction of the wind. When not defended in the first and direction of the wind. When not defended in the first wind direction of the wind. When not defended in the first wind direction of the wind. When not defended in the first wind direction of the wind. When not defended in the first wind di

stove or firegrate, or by hot water pipes, the air may be heated, but is not foul. But assuming that the air is both heated and vitiated, it does not follow that the foul air will ascend to the top of the room, air is both heated and vitiated, it does not follow that the foul air will ascend to the top of the room, since certain noxious matters, as carbonic acid (the chief product of respiration), are heavier than air, and with a still atmosphere, and the source of vitiation at the height of a man or of a bed only, will, in a degree, tend to accumulate in the lower part of the room. The practice is, undoubtedly, correct in reserved from the products of gas burning and to determine from the products of gas burning and to accumulate in the lower part of the room. The practice is, undoubtedly, correct in reserved from the products of gas burning and foul air are leasted to the generated heat and foul air are leasted to the generated heat and with few persons at night, without gas or fire, and with few persons also ping in a room, it is not applicable. In such conditions it is true that the heat is generated, and the least the heat is generated, and the least the degree of the whole of the exceeds, and further ascent is retained or prevented. The highest the room, and the less the degree of heat generated, the weaker will be the seconding current, and the less the cultury of air will puss out by ventilators in the ceiling, whilst, on the contrary the greater the supply of heat, and the lower the room, the stronger will be the ascending current, and the greater the quantity of air which will escape. the greater the supply or heat, and the lower the room, the stronger will be the according current, and the greater the quantity of air which will escape. Hence its operation is not equal and universit; and, from the story strains that it is will be seen that it is a party impubilists to residue the facts, in the conjugate with a residue of operating in the large part of the room, that is to say, where the four air is generated.

generated.

Further, it is not an universal proposition that air will be admitted below and escape above. With little increase of heat it will be admitted both above and below, and with much increase of heat it will escape both shove and below, although in greater amount above than below. Some of the openings so wasted in the below. Some of the openings so wasted in the control of the control desired those the size of the tube, the difference of temperature of the internal and external air, and the force of the wind, but where the tube is large, and the generation of heat is not great, the current is usually inwards. Some such ventilators have the tube divided by a perpendicular diaphragm, which, in fact, makes the one tube into two, and is stated that the air ascends by one and it descends by the other. Whether it will ascend by either depends upon the amount of heat generated within the room, but even where the latter is very great, and there is upon the amount of heat generated within the room, but even where the latter is very great, and there is a strong current upwards, it will be found that there is an ascending and descending current in both tubes—currents not of equal force or volume, but varying with the admission of air by other openings, as I observed when instituting inquiries into the sanitary state of printing houses and workshops for the Privy Council.

The fallacy which lies at the root of these states ments is in ignoring the fact that inhabited more than the property of the sanitary state of printing houses and workshops for the privy Council.

ments is in ignoring the fact that inhabited rooms are not boxes hermetically sealed, or having only are not boxes hermetically sealed, or having only one opening for the admission of air, ignoring the existence of doors and windows, which even when closed allow a certain quantity of air to pass. If the room were a box, closed except at the ventilator, it would follow that if air passed out it would also pass in by the opening; and it may be that under certain conditions of temperature the air would rise in one than the sealer of the passed on the conditions of the passed on the sealer of the passed on the passed conditions of temperature the air would rise in one table and fall in another, but such rooms do not exist. The most frequent approach to this condition is where there are two fireplaces in one room, in one of which a fire is burning, and the doors and windows fit well and are shut, for in such a case that may be a down draught in a chimney without a fire. But even this is not universal, for with the tendency to rarefaction of the air which occurs by reducif of this heated air passing up the chimney, the heated placed at the sides of the door or window will perceive air unusual rush of air inwards to prevent a victoria; and thus prevent the necessity for a down draught. Moreover, where there is only one chimney, and the doors and windows fit closely, the fire languishes, and the more so the longer the doors and languishes, and the more so the longer the doors and windows remain shut from the rarefaction or loss of air

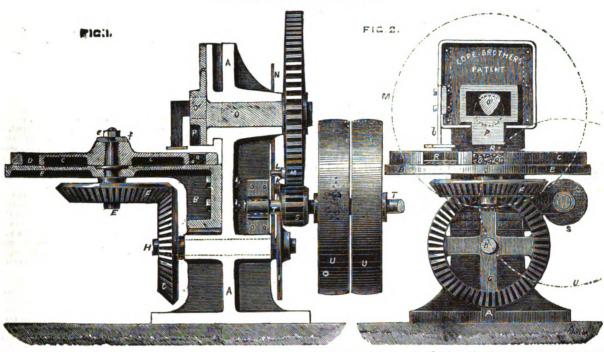
which the heat induces. Open the door or window, and the fire will brighten, and the sense of oppression felt by the inmate will pass away.

It practice it will be best to consider that air will look either said leave by openings communicating with file external air wherever placed, and with the crafficient of doors and windows if air be crafficled to construction of doors and windows if air be crafficled and with the craffic with a whole the deficiency will be immediately supplied, but, in order that heated air may be quickly removed, it is essential that there should lie openings at the upper part of the room.

Other workflators are placed in the moner part of

### TOBACCO PRESS.

BY MESSRS. COPE BROTHERS.



current is from without and downwards. Hence

current is from without and downwards. Hence some defence is needful, and if none be provided, the inmates will, if possible, extemporize one by the aid of rags, clothing, or bricks. The defences are:—

1. Perforated zinc of varying degrees of fineness of perforation—the finer, the more is the current divided and the less it is felt, whilst, at the same time, the greater is the impediment offered to the admission of air, and the less air is admitted in a given time.

given time.

2. A solid, but movable barrier, which may drawn away laterally or vertically, or allowed to fall forward into a kind of hopper, or the ordinary glass or wooden louvre ventilators. Such may be entirely or wooden louvre ventilators. Such may be entirely closed, and then they are no longer ventilators, and when the hopper is open not only is the current directed upwards, but the entrance of air is impeded. Hence, when open, the value of these ventilators varies with the quantity of air which they admit in a given time, and their fitness depends upon their sufficiency, and upon the sensation which the inmates have of the existence of a current.

3. A fixed barrier to the direct entrance of air, placed at a little distance from the external or internal opening. This is sometimes so effective as to nearly

placed at a little distance from the external or internal opening. This is sometimes so effective as to nearly destroy the value of the ventilator by preventing the entrance of air.

4. Different elevations of the external and internal

the entrance of air.

4. Different elevations of the external and internal openings, by which the entering current strikes the wall, or the side of the tube, before it is admitted into the room, and its force is broken. The efficiency of this depends upon the length of the tube and the force of the wind.

A third series of ventilators act by mechanical means, or by an arrangement for the production of heat, and consist of tubes, of various forms, which communicate with the rooms and the external air.

The Archimedean screw is an example of the former, and, being placed at the top of the flue, is moved by a vane, acted upon by the wind. It has been proved that a screw, moved in this manner, carries up a column of air as it would a column of water; but it is dependent for its action upon the wind, and when winds are light, as in summer, and circulation of air is specially required, it fails. When in action its efficiency depends upon the length and diameter of the tube, in relation to its own power, and it is more efficient in the upper than in the lower rooms of a lofty house. It must also be added, that the tube will act as a ventilator, like other tubes, without the screw, and will admit or give exit to air on the principle already laid down.

Special openings into the chimney, as by Arnott's and Toynbee's ventilators—the former of which is liable to allow the smoke to escape—and flues passing by the side of chimneys, are examples of the second series, since their special action as ventilators is due to the warmth of the chimney, by which an ascending current of air is induced. Such flues act in proportion to the temperature of the air within them, and therefore to the heat of the chimney, their proximity to the chimney, their length, and the volume of air which they contain; and it is clear that neither ventilation into chimneys, nor flues placed by the side of a chimney, can produce an upward current where there is not a fire burning,

or where the chimney or special flue is not heated. or where the chimney or special file is not heated. This is very frequently forgotten by architects, and as; fires are not commonly made in bedrooms at any season, nor in any rooms in the summer time, they fail to produce an ascending current. Yet they may not

as in some part of commonly made in bedrooms at any season, nor in any rooms in the summer time, they fail to produce an ascending current. Yet they may not be entirely useless, since air will usually descend by them when it cannot ascend, and they supply air to the room; and as the special flues are less dirty than chimney flues, the air they admit may not be disagreeable to the senses.

To remedy this defect, a jet of gas is sometimes placed within the flue or a reservoir of hot water, or a fire is placed near the upper part of the flue with a view to produce and maintain an ascending current of air. The efficiency of all these methods depends upon the amount of heat applied in relation to the width and height of the flue, and it must not be assumed that because there is a single jet of gas in some part of the flue an ascending current will be always maintained. The efficiency must be tested by experiment. The openings of such flues are sometimes placed at the ceiling, either with one grating or with several, more or less concealed in the cornice which extends around the room; or they are placed at different elevations in the side walls, or on the central line of the floor of the room. One of the more recent inventions of this class is the ventilating gas burner, by which fresh air may be admitted from without, and consumed air emitted by the chimney; but the state of the ceiling shows that, in some instances at least, the whole of the foul air is not removed, and it is too costly for universal use. Another is the ventilating stove, by which fresh air may be admitted from without, and warm air driven through into the room, and both currents may be regulated. This may be adopted without much increase of cost if the stove be introduced when a stove of some kind is needed. Care should be taken to remove the entrance opening of without much increase of cost if the stove be introduced when a stove of some kind is needed. Care should be taken to remove the entrance opening of the warm air so far from the chimney opening that the current may not be directed up the chimney instead of into the room. The forcing or suction pump, or the driving wheel, may also be mentioned; but their use is restricted to large public buildings. They are, however, very effectual in creating a draught, whether by withdrawing or injecting air. All these artificial methods, however, are costly, and nearly all of them are dependent upon conditions which require the aid of man.

(To be continued.)

### MESSRS. COPE'S TOBACCO PRESS.

WE recently noticed the improvements effected W by Messrs. Cope Brothers, of Lord Nelson-street, Liverpool, in tobacco-spinning machinery. We now draw attention to another mechanical We now draw attention to another mechanical arrangement which will prove of value to the manufacturers of cavendish tobacco. This is a press for moulding tobacco, and which is now in use at the Richmond Cavendish Company's bonded works, where sweetened cavendish, similar to the American, is manufactured under Gladstone's Act. In our engraving (for which with particulars we are indebted to the "Tobacco Trade Review") we give

at fig. 1 a side elevation, partially in section, and a fig. 2 a front elevation of this machine. A is a strong framing of cast metal, standing on a solid foundation, having bolted to it B, a circular stationary metal plate. This plate is turned on the top side to a true surface, and formed with an openstrong framing of cast metal, standing on a solid foundation, having bolted to it B, a circular stationary metal plate. This plate is turned on the top side to a true surface, and formed with an opening in it a little to the left to allow the thrust-plate b to push out the formed and pressed tobacco. Upon this plate is mounted the die or movable plate C, which is also circular in form, having near its circumference a number of die-holes D. A shaft E passes through these two plates, and upon it is a wheel F, gearing into the wheel G, on a shaft H, which presses through the framing A, and carries the pawl k and the stud L secured in the driving-wheel, the stud L, comes into contact with the lever N, and moves the die table C, bringing another die D under the die-piece or presser P. A cam-shaft O is fitted into the driving-wheel, and thus actuates the die P, the required stroke for pressing the tobacco, and at the same time pushing out the previously pressed tobacco through the openings in the lower plate B, into a travelling apron. By this arrangement of mechanism it will be seen that the cam O, for a quarter of its diameter, is turned from the same centre of the shaft, so that the slide or diepiece P ceases its motion for a time at the top and bottom of its stroke. The tobacco remains under pressure for a quarter of this revolution. The same takes place at the top of the stroke, thus giving the die-table C sufficient time to move from one die to the other before the die-piece P descends again upon the tobacco Q, in the next die. The tobacco is usually covered over by a thin metal plate R, which fits the die exactly, and keeps the tobacco in position until the die-piece P comes down upon it and presses it to the required thickness, when on the next moye it is pushed out by the thrust-plate b. The full pressure of P is exerted with ordinary shag tobacco for two seconds on each die full. The machine for manufacturing cavendish, rifle-cake, or any other tobaccos of this class. Hitherto manufacturers have had to part

On Saturday week a peal of six bells were cast at Messrs. Blew's foundry, Birmingham, for a church at Yass, near Sydney.



THE RECENT EARTHQUAKE SHOCKS. AT the ordinary meeting of the Manchester Literary and Philosophical Society, held March 23, 1869, the Rev. William Gaskell, M.A., vice-president, in the chair, Mr. E. W. Binney F.R.S., F.G.S., stated that he was sitting in his dining room, Spring Bank, Crumpsall, reading at the time he felt the earthquake on the 15th The height of his house above the sea would be about 240ft., and the drift deposits underlying it consist of 50ft. of sand and about the same thickness of till or brick clay resting on the pebble beds of the trias. His sensation of the shock was as if the bed in the room over him had been drawn from east to west, and immediately afterwards the chair in which he was sitting on the west side of the room moved as if the foundations of the house were giving way. The shock did not last more than a second. The windows in the house rattled, but no one in it beside himself noticed the occur rence, which took place about nine minutes past six p.m. The feeling he experienced at the last, of the foundations of the house appearing to give way, was extraordinary, but the other sensations felt would not have attracted his attention, and he is of opinion, that very few people in the neigh-bourhood of Crumpsall would have known it to have been the shock of an earthquake had they not been told, or seen it described in the newspapers

of the following morning.

He is convinced that the shock would be felt much stronger in those houses which were built upon the pebble beds at Cliff Point, in Lewer Broughton, as was the case of the residence of the President, Dr. Joule; the vibrations of the bare rock being very different there from what they would be where it was covered with 100ft of plastic clay and soft sand, as at Crumpsall. As far as he has been able to learn, the shock appears to have been felt in an east and west direction between Huddersfield and Manchester, and from Stockport to Burnley, along the line of the pennine chain, which forms the high land of Lancashire and Yorkshire.

The tract of land lying between the two great dislocations of the earth's crust in the neighbourhood of Manchester, running nearly parallel to the pennine fault, namely, those of Smedley and Clayton, and the Great Irwell faults, displacements of the strata to the extent of between 3,000 and 4,000ft., would lead us to expect that any disturbance of the earth's surface would be felt with greater intensity between those two great lines of fracture. Now, Smedley Hall and the President's residence at Cliff Point both lie in this tract, and being placed on or near the solid rock, the vibrations would be much more jarring and severe as was, he believed, the case at both places, than where he (Mr. B.) felt them at Crumpsall, on a thick cushion of clay and sand. Mr. Spence stated that he and several members of his family also felt the shock on the 15th ult., at his residence, Smedley New Hall, and that it was accompanied by a loud noise as if a heavy package had fellen on one of the chamber floors

The following communication on the same subject, from Mr. T. T. Wilkinson, F.R.A.S., was road:—A very smart shock of an earthqueke was felt at Burnley on March 15, 1869, at about 6 hours 8min. p.m. I was standing in my room at the time, with my face to the S.E., and was startled by a rumbling sound behind me. It appeared to pass from about N.W. towards the S.E. or almost exactly in the plane of the magnetic meridian. At first I imagined a wall was falling down in the next apartment, but in an instant I was thrown forwards—then came a violent tremor—and lastly a settling back into my original position. The duration of the shock was not more than four or five seconds. On making inquiry I found that many others had experienced similar sensations, and that much alarm had been created by the shock. In some of the mills the looms appeared to be heaved up-doors were displaced-and the more delicate machinery thrown out of gear. House bells were set ringing, and the crockery rattled as if about to fall from the cupboards. The dogs howled as if in alarm—the cannry birds fluttered about in their cages—and several horses refused to move on for some time after the shock. In the higher parts of the town the walls of the houses swayed to and fro, and now exhibit cracks; and the twist split a strong supporting beam in one of the shops in Manchester-road. The stalls in the open market were much shaken, and one of the hucksters ran round his canvas with the intention of catching the youngster who was playing him a trick. So far as I can judge, the magnitude and duration of the shock were very similar to those in the earthquake which passed through this district in July, 1839.

AMERICAN NAVAL BOARD.

A FEW weeks since we particularized the pro-posed formation of a Board of Naval Admini-stration in the United States. The Bill for authorizing this step has passed the Senate. It provides for the creation of a Board of Naval Survey, which is to consist of three officers not below the rank of rear-admiral, who are to have general supervision of all matters relating to the construction and equipment of vessels, the management of navyyards, &c., and make recommendations in regard thereto to the Secretary of the Navy. No promo-tion is to be made to the rank of Reutenantcommander on the active list until the number in that rank is reduced to eight, which is thereafter to be the limit; the number of lieutenants is hereafter to be 280, and the number of masters and ensigns is fixed at 100 in each rank. The number of officers in the medical pay and engineer corpsists to be reduced to specified limits by ceasing to make promotions until the limits are resched. The marine corps is to be constituted as follows:—one brigadier-general commandant, one colonel, one lieutenant-colonel, three majors, one adjutant and inspector, one paymaster, one quartermaster, one assistant quartermaster, fifteen captains, twentyfour first-lieutenants, twenty-four second-lieutenants, one sergeant-major, one quartermaster-ser geant, one drum-major, one principal musician, 150 sergeants, 150 corporals, 130 musicians, drummers, and fifers, and 1,500 privates. The reduction is to be made by ceasing promotions. An additional section provides that the students in the Navad Academy are hereafter to be styled cadet midshipmen. The pay of midshipmen is fixed at 1,000 dollars per annum. The Bill now goes to the House, but it is thought hardly likely that it willness through this Santin pass through this Session.

WEATHER IN AUSTRALIA.

THE thermometer at Melbourne Observatory on January 27 reached 99-5deg, in the shade; at Greenwich Observatory the highest was 46deg, in in the shade, or less than half the amount at Melbourne. The hottest day of the season, however, in Melbourne was the day before Christmas Day. when the thermometer marked the extraordinary height of 110deg. in the shade. Cattle and sheep in when the themometer marked the extraordinary height of 110deg, in the shade. Cattle and sheep in Australia have suffered very severely from want of grass and water. In a Wagga Wagga paper we read that "in almost every direction the roads are swarmed with flocks of wretched animals, mere bags of bones seeking in vain for a mouthful of something, anything, to eat. A flock belonging to Mr. Morton, Grubbengong, had been driven to Bland's Creek, and were brought back to Grubbengong, with a loss of 1,300 from starvation and thirst; 500 were lost at one fell swoop by rushing pell-mell, in the agonies of thirst, into a water-hole, and smothering themselves in the mud." On reference to tables prepared at the Melbourne Observatory, we find that the total rainfall at Melbourne for 1868 was 18-3in., the average for the last ten years being 25-2in. Thus 1868 was deficient in rainfall to the extent of about 7in. The winter season was especially deficient, as 1808 was dencient in rainfall to the extent of about 7 in. The winter season was especially deficient, as in the three months June, July, and August only 3-7 in. of rain fell. The consequence was that the ground failed to be properly saturated at the proper season, and vegetation was thus unable to resist the weather of the summer time. The rain which fell during December was 1.2in., being 2.0in. below the average of the same month for the last ten years.

The adoption of street tramways is now likely to be sanctioned by Parliament, a committee of the Lower House having on Tuesday, with certain restrictions, agreed to the preamble of the bill now promoted for their establishment.

Science and ART .- A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the the great power of skilled mechanical about is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brocches, Earrings, Lockets, &c., &c., suitable for Wedding. Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to balance-spring of a watch. From its extreme fineand they cannot be too strongly recommended to an incur-cent is about to be piaced in Worcester those contemplating a purchase, especially to Cathedral. The new peal is to cost £3,000, and residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[Advi.]

ELECTRO-ASTRONOMICAL EXPERIMENTS.
THE United States Coast Survey officers have

been engaged for some time past in making astronomical observations, by the aid of telegraph, between the cities of the Far West and Cambridge University. For the purpose of arriving at the difference in mean time between San Francisco and difference in mean time between San Francisco and Boston, the wires of the Western Union Telegraph Company have nightly been connected, for nearly a month past, from one side of the continent to the other, and the ticking of a chronometer in Cambridge other, and the techniq of a combineder in Cambridge University has been observed and recorded in San Francisco with a most remarkable degree of accuracy, This is done by connecting the pendulum of the chronometer at Cambridge with the wire, in such a manner that the main circuit is broken, and instantly closed again at every beat or tick of the timepiece, and the result is that each second of time, as marked and the result is that each second of time, as marked by the chronometer at Cambridge, goes forth from the University on the Atlantic coast, and, with almost the speed of light itself, hurries on over the magic wire, passing through intermediate cities, towns, and villages, severe were over mountains, and doing the open country, that it finally reaches the recording instrument on the passing coast in all of

recording instrument on the resemble coast in all of its original fullness of pulsation.

As any time during an evening of the past month, says file. Buffulo Courier, a visitor to the operating rooms of the Western Union Telegraph Office might have heard one of the little instruments beating the mayo neard one or the little instruments beating the measured time of the sixtieth part of a minute, with the montony and regularity of a chronometer itself. Tick! Tick! One, two, three, four, five minutes clapse, and then the little monitor ceases. minutes elapse, and then the little monitor ceases. Back comes the answer from San Francisco to Boston: "All right; your second signals came good, and have been recorded for five minutes. Go ahead five minutes more!" Again, Tick! Tick Tick! for five minutes, and then San Francisco says again: "All right; are you ready to take my signals?" And the answer from Boston is: "Yest; go ahead." Tick! Tick! Tick! says San Francisco for the allotted five minutes, and Boston says, in his turn, "All right!" But notwithstanding the speed with which the

But notwithstanding the speed with which these pulsations of a clock fly from one side of our continent to the other, it is known that there is a loss, a very slight loss of time in the transmission. How to arrive at this loss, and measure it, is the next question. Nothing easier; a second wire is switched into place, a "repeater" added at Boston, and, presto! 'tis done. Now the clock ticks made at San Francisco rush on the wings of light, overthe 3,000 miles of wire to Boston, and back again to San 5,000 miles of wire to boson, and beet again to see second Francisco over the second wire, and record themselves at the point of starting, in something less than 60 seconds of time, having, in the interval, traversee 6,000 miles. Last Monday night witnessed the successful completion of this last experiment, and

successful completion of this last experiment, and the flight of electricity was actually measured, so to speak, as easily as one measures a yard of muslin. Never befere in the world's history has such a wonderful feat been attempted, and that this has been brought to a successful conclusion is due entirely to the beautiful working of the Western Union Company's wires, together with the assiduous attention and superior ability of its employees. Trace the route on the map, and mark the immense distance so lightly glided over by the subtle fluid. The route is from Boston through Albany, Buffalo, Detroit, Chicago, Omaha, Cheyenne, Salt Lake City, and Virginia City, to San Francisco, and this route is of course doubled, forming, for all practical purposes but a single oircuit.

WORCESTER CATHEDRAL BELLS.

A NEW mode of tolling great bells has just been applied to the 44-ton bell lately cast by Messra. Taylor, of Loughborough, for Worcester Cathedral, and recently hung there. The bell has been hung on a new plan, which with the clock and peal of twelve bells, is designed by E. B. Denison, Q.C., and gives a new effect to bells which are too heavy to be rung in the usual way. According to the "Horological Journal," the gudgeons, or pivots, instead of being round, are wedge-shaped, like those of a scale-beam, and roll on hard brasses very slightly hollowed. The friction is thereby made so little that this great bell can be tolled easily by one man with one hand. It is actually much easier than clappering, or pulling the clapper by a rope, yet brings out the full tone of the bell much more grandly. This tone is half a note below the fourth quarter bell of the Westminster clock. The heaviest bells in England might be made tollable in this way at a very small expense, where most of them are NEW mode of tolling great bells has just been bells in England might be made tollable in this way at a very small expense, where most of them are only inadequately struck by hammer or by clappering, which is the cause of nine out of ten cracked bells. No wheel is required, but only a long lever fixed to the stock. The gudgeons must not be lower than the top of the bell. A series of ten bells and heur-bell is about to be placed in Worcester Cathedral. The new peal is to cost £3,000, and this sum has been subscribed in honour of the Dean (the late Sir Robert Peel's brother) as a testimony



WORKING MEN'S CLUBS AND THE HOLBORN VIADUCT.

HOLBORN VIADUCT.

ON Saturday last, the members of working men's clubs had permission to visit the works now in progress between Holborn and Newgate-street, the permission having been obtained through the influence of the Working Men's Institute and Union. At three o'clock, about eighty members assembled at the Farringdon-street gate, and were conducted to one of the vaults under the central line of the roadwart. The passage and vaults being lighted up, with one of the vaults under the central line of the roadway, the passage and vaults being lighted up with gas for the occasion, and the walls of the vault being well covered with the working drawings of the works, both in general and in detail. Here Mr. Hall described, in a very straightforward and intelligent manner, the difficulties the engineer, Mr. Haywood, met with, whose design the Corporation of London net with, whose design the Corporation of London nultimately selected, through the instrumentality of Mr. Deputy Fry, the chairman of the City Board, in opposition to their own architect, Mr. Burney. The body of members were then taken by Mr. Lidstone through doorways and down steps into passon Mr. Deputy Fry, the chairman of the City Board, in opposition to their own architect, Mr. Burney. The body of members were then taken by Mr. Lidstone through doorways and down steps into passages where persons only could pass and stand in single line. Each of the sewers, subways, and other subterranean passages, were explained by Mr. Hall while the members were in them. Having explored the whole of the underground portion, they ended their earthy travels by passing up through a sewer flap let into the path of the circus at Hattongarden. They then entered the gates at that end, and went over the works above ground, and, truly, from this point of view, the extent of the undertaking is marvellous, there being nothing to obstruct the eye from one end to the other except the framework of timber by which the girders for the bridge are being raised; and even this does not interfere in any way, on account of the curve the viaduct takes, the framework being slightly on one side. The upper portions of the works were closely looked into as the men passed along towards the bridge. At this point they descended the steps of the staircase on the south-west side down to the starting place. They then crossed over Farringdon-street, and passed up the south-east staircase and went over that portion of the works up to St. Sepulchre's Church. Here they had the pleasure of forming the first body of the general public who stood upon and promenaded the finished flagged portion of the path, a circumstance which will be a pleasing remembrance to many of them in days to come. Here some of the members left the body and passed out at the east entrance gate. The others went back to the vault and expressed themselves also satisfied with the arrangements that Mr. Haywood had made for their reception. The inspection occupied about three hours and although the men were much fatigued. and expressed themselves also satisfied with the arrangements that Mr. Haywood had made for their reception. The inspection occupied about three hours, and, although the men were much fatigued from the labour they had undergone in walking down, into, under, and over the vast works, they could not help expressing their admiration of the business-like manner with which the bricks were laid, many of the men being judges of work and material in that line. For our own part, and for the public generally, we feel sure that if similar excursions on large works by working men were allowed to take place, many good results would follow both to the men and to the contractors, as the working class are always open mouthed, and would, working class are always open mouthed, and would, by their expressions, point out practically where faults or errors exist, which could be altered by the contractor before the works have gone too far.

COAL IN GERMANY.

COORDING to the "North Germany Correspondent," Germany is now the second on the list of the coal-producing countries of Europe. In 1850 the English mines yielded 800,000,000 centners (the centner is equal to 110½lb.), those of Belgium 105,000,000, those of France 100,000,000, while not more than 90,000,000 were gained from the German coal fields. The total consumption of Europe in that year has been estimated at about 1,300,000,060. In 1867, on the other hand, not less than 3,000,000,000 In 1867, on the other hand, not less than 3,000,000,000 centners were consumed, and the proportion contributed by the various nations had changed, contributed by the various nations had changed, England, it is true, still stood first on the list with 2,000,000,000 centners, but next came Germany with 480,000,000. Of these, 48,000,000 came from Saxony, and 420,000,000 from Prussia. Germany imports about 12,000,000 and exports more than 70,000,000 centners of coal. Russia, France, Switzerland, Holland, and Belgium are her chief foreign markets, but the German cannot compete with English coal in the districts that border on the North Sea and the Baltic. Hamburg, for instance, does not consume more than 50 centners of German coal. This is generally attributed to the difficulties does not consume more than 50 centners of German coal. This is generally attributed to the difficulties of transport, but we should be inclined to attribute it at least in part to the inferiority of the article. The chief coal-fields of Germany lie in Upper Silesia (yield above 100,000,000 centners), Saxony (48,000,000 centners) on the Saar and on the Ruhr (120,000,000). None of these, with the exception of the Saar district are worked as completely as their extent would admit.

### Correspondence.

BOURNE'S WHIRL-WHEEL STAR POINTER. TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

TO THE EDITOR OF THE "MECHANICS" MAGAZINE."

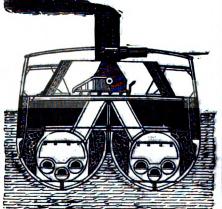
SIR,—Several years ago, I devoted considerable study to the application of the gyroscope for the objects contemplated by Mr. Bourne. I came to the conclusion that those objects could certainly be attained, but only with apparatus of excessively accurate, refined, and expensive construction. I am sorry to say that I do not think that Mr. Bourne's plan would answer. He appears to rely on what he terms "the stability of the planes of rotation," but to give accurate results such stability must be absolute; whereas it is impossible to render it absolute, not merely because of physical difficulties and imperfections, but also because the laws of mechanics do not admit of it, except in the suppositive but practically impossible case of an infinite velocity of the wheels. As regards details, I would observe that Mr. Bourne has more wheels than are necessary, involving extra complication and expense. observe that Mr. Bourne has more wheels than are necessary, involving extra complication and expense. Three wheels are quite sufficient. I also think it is a mistake to propose to make them large. The power required to drive them, if 3ft. in diameter, would be found to be a serious consideration.—I am, Sir, yours, &c., Sir, yours, &c., Glasgow, April 10.

### SHIPS OF WAR.

SHIPS OF WAR.

SIR,—We look into all the modern appliances for working heavy guns on board ship, and find, with many a mass of complicated machinery, it ill-suited for the rough usages of war. We have for long sought a class of vessel for coast and harbour defence—a powerful ship, adapted for the percussive mode of warfare; a speedy and stable vessel, suited for ocean navigation. That such a vessel must be a steamship, no one will dispute. She must be fitted with powerful machinery, for attaining great speed and for steaming off a lee shore. Sails may be entirely dispensed with in such craft, as their powers of endurance at sea will just be regulated according to the amount of fuel they can carry. If the hydrocarbon method can be introduced, a great step will be gained. gained.

Step by step we have worked out the old salts; their occupation is gone, and modern Jack must be taught quite differently—but how are we to commence? Are the guns to be trained in a revolving turret, on a broadside, in fixed central turrets, in that unhappy larboard and starboard end-on fire? With Captain Scott's system, Armstrong, the Moncrieff gun carriage, or how? That I must leave for others to decide; so I will now introduce my "twins," suited for them all. An explanation is given further on, and I will merely state that for the twin screw mode of propulsion I have sought a better form than originally practically demonstrated by the late Mr. G. Rennie, C.E. I had an early opportunity of forming an opinion as regards twin screws, and there can be no doubt in my mindthatthe deeper the vessel is the better—that is, if she is not a great square tub, with the screws bracketed close to the vessel. I believe each screw should propel its own Step by step we have worked out the old salts: square tub, with the screws brakered close to the vessel. I believe each screw should propel its own section; a twin ship, propelled in a twin manner; a river of water, flowing through and under the body of the "Hercules," or with a much smaller vessel, as



shown in the sketch herewith, so that the screws act in a more solid fluid.

There are certain difficulties to contend against firstly, there are two inimical sections, having only one bow, common to both, this form giving great strength to resist percussion, as there are four thicknesses of plating at the bow, with a central division let into the bar keel on the centre line. This strength to resist percussion, as there are four thicknesses of plating at the bow, with a central division let into the bar keel on the centre line. This plated all over, the armour of the monitor type, with conical fixed turrets, to suit the Moncrieff system. There will be a light spar deck, and the outward form, above water, will just be like any ordinary ship, the length being not less than six times the beam, the draught of water for being commissioned by the 30th inst.

being about 20ft. I need scarcely say that the engines will be of the most improved description, while the boilers will be constructed for the indicated power. The launching my bark on the billows of criticism, I am confident that she will ride gallantly through the seething breakers of prejudice, and in some future time, when steaming swiftly against the imaginary foe some always seem to have in view, that our endeavours and time have not been altogether thrown away.—I am. Sir. yours. &c.. thrown away.—I am, Sir, yours, &c.,
John G. Winton.

13, Gladstone-street, April 12.

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly, payable in

or all is. 8d. yearly, or 10s. 10d. half-yearly, payable in advance,
All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE, Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

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N. T.—H. L.—A. C. P.—W. T. C.—J. Q. B.—T. C.—J. H.—
R. M.—W. H. N.—F. W. H.

### Heetings for the Meek.

Mon.—Royal United Service Institution.—Colonel F. Bernard Collinson, R.E., on "A Proposition for One General Military School for the Army,"

Bernard Collinson, R.E., on "A Proposition for One General Military School for the Army," at 8.30 p.m.

Society of Engineers. — Discussion on "The Methods Employed in the Determination of the Commercial Value and Purity of Coal Gas," at 7.30 p.m.

Royal Institution.—Professor Grant on "Stellar Astronomy," at 3 p.m.

The Institution of Civil Engineers.—Adjourned discussion upon Mr. Kirkham's paper on "Standards of Comparison for Testing the Illuminating Power of Coal Gas;" and, time permitting, Mr. William Shelford, M. Inst C.E., on "The Cutfall of the River Humber,'. at 8 p.m.

WED.—Civil and Mechanical Engineers' Society.—Mr. W. Lawford, M. Inst. C.E., Resident Engineer, on "The Bridge Carrying the West London Extension Railway Over the River Thames,"

at 8 p.m. oyal Institution.—Professor Tyndall on "Light,"

at 8 p.m.
THURS.—Royal Institution.—Professor Tyndall on "Light," at 3 p.m.
FRI.—Royal Institution.—Mr. E. B. Tylor, on "Survival of Savage Thought in Modern Civilization," at 8 p.m.
Royal United Service Institution.—Mr. Frederick Wingfield, Deputy-Assistant Commissary General, on "Military Transport," at 3 p.m.
SAT.—Royal Institution.—At 3 p.m.

## Haval, Military, and Gunnery Items.

THE flying squadron is to consist of the "Liver-pool" (flag), "Liffey," "Phoebe," "Endymion," "Bristol," "Clio," and "Scylla." Some of these ships are already in commission, some are not yet quite ready, and whilst others are, as yet, on foreign

M. DUPLY DE LONE, the well-known French naval engineer, has been permitted by the Emperor to resign his post at the Ministry of Marine, and has announced his intention to come forward as a candidate for the representation of one of the seaport towns in the next Legislature.

Ir will be remembered that the iron frigate "In-It will be remembered that the iron frigate "Inconstant" lost her rudder on a trial trip down to the Haven from Pembroke. A new rudder, constructed on the balance principle, has been successfully east at the dockyard foundry. It is formed wholly of gunmetal. The "Inconstant" is expected to be undocked on the 26th, and will leave for Portsmouth on the 28th, where she will be put in

A RETURN just published shows that of the correspondence despatched to the United States during the past year, Messrs. Cunard received sea postage amounting to £28,686, Messrs. Inman to £23,390, the North German Lloyd Company to £11,772, and the North German Lloyd Company to £11,772, and the Hamburg American Company to £5,157. These sums are computed at 1s. per oz. for letters, 3d. per lb. for papers, and 5d. per lb. for books. It should be remarked that the contract with the Hamburg American Company terminated on the 31st of October in last year.

WE notice that the Government of Victoria is WE notice that the Government of victoria is advertising for tenders for a monthly service for mails and emigrants between Great Britain and Melbourne via the Cape. The vessels—steamships, of course—are not to be under 2,500 tons register, and course—are not to be under 2,500 tons register, and are to possess accommodation for 500 steerage passengers. The dates of despatch will be fixed by the Postmaster-General of Victoria. Tenders are receivable by Mr. George Verdon, of 8, Victoria Chambers, Westminster, the agent-general for Victoria, up to October 8. The postmaster-general at Melbourne will receive tenders until the arrival of the residue at Melbourne. the mail due at Melbourne, November 25.

THE Board of Trade have awarded a telescope to Captain Von Schantz, of the Russian barque "Gefion," for his humanity in receiving a portion of the ship-wrecked crew of the barque "Aldivalloch," of Sunwrecked crew of the barque "Aldvalloch," of Sunderland, on board his vessel, on the 21st of January, 1869. The "Aldivalloch," was from Bourgos to Falmouth, with a cargo of barley. On the 15th she sprang a leak, and on the 19th the crew abandoned sprang a leak, and on the 19th the crew abandoned her in a sinking condition, in lat. 37-92 N. and long. 8-56 W. The master and crew were received on board the "Meggie Armstrong." and five of them were subsequently transferred to the barque "Gefion," which remained eighteen hours by the "Meggie Armstrong" to effect their transfer.

### Miscellanea.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending April 10, was 4,217. Total number since the opening of the Museum, free daily (May 12, 1858), 1,546,537.

THE death of Mr. Mm. Bradbury, of the well-known publishing firm of Messrs. Bradbury and Evans, is announced. He died at the age of 70; and had been many years in business with Mr. Frederick Mullet Evans as a publisher.

IT appears that, according to the octroi returns, Paris consumed, in 1867, 50,000 deer, 625,000 partridges, 80,000 pheasants, 200,000 snipes, 40,000 quails, 45,000 plovers, 400,000, turkeys, 700,000 eapons, 700,000 ducks, 1,700,000 geese, 4,500,000 chickens, 1,700,000 larks, 1,700,000 rabbits. The value of all is stated at £1,040,000.

WE are requested to state that the Diplomes WE are requested to state that the Diplomes d'Honneur, gold and other medals, and certificates of Honourable Mention, awarded to British exhibitors by the International Jury at the Havre Maritime Exhibition, can now be obtained on application to Messrs. J. M. Johnson and Sons, of Castle-street, Holborn, the Commissioners for the United Kingdom.

of those frightful accidents which un-ONE of those frightful accidents which un-fortunately so often accompany the carrying out of great public works occurred last Tuesday at Saltburn-by-the-Sea. An iron bridge 100ft. in length across the famous glen along which Skeltonbeck runs to the coast, was nearly completed, when an immense iron girder slipped from its holding and knocked down one of the piers, killing three men.

DURING the first fortnight of March, the length driven at the Mont Cenis tunnel was 67:20 m., of which 40:10 were on the Italian side, at Bardonneche, and 27:10 on the French side at Modane. The position of these works up to March 15 was the following:—Length driven at Bardonneche, 6,514.70; Length driven at Modane, 3,939; Total length driven, 9,453.70; Remaining to be driven, 2,766.39; Total length of tunnel, 12,220.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending April 10, 1869.

was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 13,983; Meyrick and other galleries, 3,043; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,434; Meyrick and other galleries, 285; total, 19,745. Average of corresponding week in former years, 12,174. Total from opening of Museum, 9,338,369.

LAST week some workmen were employed in digging the foundation of a house on the Cowley road, Oxford, when they came upon a large quantity of old coins, enclosed in an earthenware pot. The pot was broken by the workmen, and the coins were dispersed and taken away by a number of persons who happened to be near the spot. They were all of silver, and of different sizes, the largest being somewhat smaller than the present shilling. The coins are said to be of the reign of Edward I.

AT a recent meeting, the Council of the Emperor of Russia sanctioned a decree enacting that the former practice of coining Russian gold ducats of the value of three roubles shall be resumed. Like the half-imperials, each piece is to have the arms of the Empire on one side, and on the other the date, the mint stamp, and the legend "teheestavo zolota" eighty-one "dolyah," i.e., eighty-one parts of a "zolotnik" of fine gold. The zolotnik is the ninety-sixth part of the Russian pound.

LETTERS have been received at Gotha from the German discoverer, Carl Mauch, who is making an arrelation expedition in Southern Africa. The German discoverer, Carl Matich, who is making an exploring expedition in Southern Africa. The letters are dated November 29, 1868, and announce that he has accomplished a very important journey, although he had encountered great dangers. He started northwards on May 8 from the Potschefs river, and arrived at Inyati on October 18, having explored countries, which had never been travered. explored countries which had never been traversed by Europeans. From this point he intends this April to endeavour to penetrate northwards as far the Equator.

THERE is every probability of the meeting of the Royal Agricultural Society being held in Oxford in vear 1870 The formal invitation from Oxford was received and considered by the council at their last meeting, and met with such a favourable reception that it is all but certain the invitation will be accepted. A committee of five has been appointed the council to inspect the site for the show ground and the other accommodation which they require. Several hundred pounds are still required to complete the fund of £4,000 which it is necessary to

REFERRING to rumours recently current in Shetland, the Lerwick correspondent of the "Scotsman writes:—"It seems that gold has been discovered in Uist. It is said to exist in two localities, but whether it will pay for the working has not been determined yet. Mr. Walker, factor for the Garth and Annslerae estate, has made some offers to 'proand Annsiera estate, has made some ones to properly spectors; but they have not been accepted, and the majority seem inclined to depend rather on the 'golden ears' of the autumn field than to the gold of the 'new diggings,' and, therefore, are wisely devoting their attention to their crofts, previous to the commencement of the summer's fishing.

THERE has lately been issued a return of the names THERE has lately been issued a return of the names of the Council of India, with dates of appointments according to seniority; stating also their ages last birthday; whether previously a director of the East India Company, and, if so, from and to what dates; whether having served or resided at any time in India, and, if in the service, in what branch, and from and to what dates; the annual amount of any are resided as the service of the pay, pension, civil fund, or other allowance now re ceived for such Indian service; and the salary an allowances, if any, received as member of the Council; and a similar return of the six secretaries of departments, and of the accountant-general, the auditor, and the director-general of stores.

PARIS is the best market in Europe for leeches. PARIS is the best market in Europe for leeches. The mouth of the Danube is now the best fishing ground, and no less than £120,000 in value of leeches are annually sent to Paris from Trieste. The best leech is said to be a native of Australia, as he does his work in a shorter time than any other. The Viceroy of Egypt has granted a monopoly of 3,000,000 leeches annually, which are to be found in the bed of the Nile after the periodical inundation of that river, to a French dealer. On arriving in Paris that river, to a French dealer. On arriving in Paris those not required for active duty are sent to Gentilly, where they are lodged in reservoirs pro-vided with greasy mud and filled with greenish water.

water.

An official report has been prepared showing the amount and value of the gold obtained and exported during the first nine mouths of 1868. The yield of gold was 1,274,661oz. 9dwt., of which 1,248,704oz. 18dwt. were exported. The figures show a decrease on the returns of 1867 on every quarter. The number of miners employed was 63,482. Machinery having an aggregate of 20,683-horse power was worked on the various fields, and the gross value of mining plant was £2,133,855. There were 8374 miles of auriferous ground already worked upon, and 2,561 distinct quartz reefs were proved to be miles of auriterous ground aiready worked upon, and 2,561 distinct quartz reefs were proved to be gold bearing. The lowest price given for gold was £3 per ounce for some from Gipps Land, and the highest was £4 2s. 3d. for gold taken from the central division of the great Ballarat fields.

central division of the great Ballarat fields.

THE "San Francisco Herald" says that those engaged in the culture of silk in California have grown no less than 1,175,000 mulberry trees. They are apportioned as follows:—Los Angeles, 50,000; Santa Barbara, 100,000; Santa Clara, 150,000; Nevada, 50,000; Sacramenta, 425,000; Yolo, 400,000. The total production of cocoons in 1868 amounted to 1,350,000, equivalent to 1,917lb., allowing 704 cocoons to the pound, representing a cash value of 3,676 dols. 75 cents. To be added to this was the egg crop of 7,350oz., commanding in the market 8 dols. per ounce, amounting to 58,800 dols. There will be a vast increase in the production of cocoons this year, as three cocooneries will hatch 600oz. of eggs, sufficient to produce 18,000,000 cocoons.

## Patents for Inbentious.

### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—3017, 3022
BUILDING MATERIALS—2988, 3006, 3010
CHEMISTRY AND PHOTOGRAPHY—3009, 3026, 3031, 3033,

CULTIVATION OF THE SOIL, including agricultural implements and machines.—3023, 3028, 3033

CULTIVATION OF THE SOIL, including agricultural implements and machines. —3023, 3028, 3033

ELECTRICAL APPARATUS—None.
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c. —2082, 2889, 2995, 3003, 3007, 3011, 3018

FOOD AND BEVERACES, including the apparatus for preparing food for men and animals—3008, 3016

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments. &c. —2981, 2983, 2987, 2990, 2992, 3000, 3004, 3005, 3020, 3021, 3027, 3039, 3038

GENERAL MACHINERY—2978, 2986, 2993, 3001, 3014, 3024, 3032

LIGHTING, HEATING, AND VENTUATING, 2025, 2020.

LIGHTING, HEATING, AND VENTILATING-2976, 2979, 2980, 2987, 2990, 3009, 3010, 3035, 3038

2947, 2990, 3009, 3010, 3035, 3038
METALS, including apparatus for their manufacture—2983, 2996, 2997, 5024
MISCELLANGOUS—2977, 2986, 2998, 2999, 3014, 3027
ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—None.
SHIPS AND BOATS, including their fittings—2991, 3030, STEAM ENGINES—2994, 3012, 3019, 3037
WARFARE—3002, 3039

II J. JONES and G. E. WILKINSON, Wattling-street

Mannfacture of paste board, Dated September 26

The patentees coat a sheet of paper on both sides with The patentees coat a sheet of paper on both sides with paste or cement, by passing the sheet through a pair of rollers, each partially immersed in a trough containing paste or cement. After the paper has been so coated on both sides, two other sheets of paper are brought into contact with it, one against each of its sides, and the three sheets are pressed together by being passed through a second pair of rollers, and may then at once be cut into sheets, or may be wound on to large drums, to be subsequently cut up in another machine. The combined sheets of paper so cut into lengths are afterwards pressed in the ordinary manner.—Patent completed.

2962 G. F. MORANT, Frenchay. Artificial fuel. Dated September 26, 1868.

September 26, 1868.

The patentee produces an artificial fuel by saturating peat or turf with dead oil—or creosote, by preference—after thoroughly drying the peat. The air is exhausted therefrom, and the dead oil or creosote then admitted to the vessel containing it. Different proportions of peat and dead oil or creosote may be used, but it is preferred to make the peat absorb about one-tenth of its own weight of the dead oil or creosote.—Patent completed.

weight of the dead oil or creosote.—Patent completed.

2963 W. GALLET. Sheffield. Manufacture of cast steel.

Dated September 26, 1863.

The object is the conversion of iron ores into cast steel. For this operation, brown or red hematite ores are preferably taken, and after having broken and washed them, if necessary, they are mixed with a cement composed as hereinafter stated, and afterwards melted in furnaces or pots. The result is cast steel. The cement which is employed is composed as follows:—Carbonate of lime, 37 parts; clay, 13 parts; oxide of manganese, 3 parts; resin, 3 parts; wood charcoal, 50 parts. The above substances are mixed with about 10 per cent. of water, in which from 3 to 20 per cent. of carbonate of pofash and 1 per cent. of salt have been previously dissolved.—Patent completed.

2964 H. GIBSON, Musselburgh. Manufacture of tebacco.

completed.

2964 H. GIBSON, Musselburgh. Manufacture of tobacco.

Dated September 26, 1868.

The tobacco leaves, in a prepared state, are placed on a travelling band or belt, which carries them forward to the spinner, who arranges the leaves in a proper manner, and after the leaves have been twisted or spun by the action of a revolving frame and bobbin placed at the other end of the machine, the twist is carried between levelling rollers, which roll down the inequalities in the work. After passing through the levelling rollers, the twist is oiled previous to being coiled upon the bobbin. In order to produce a uniform coil, motion is given to the bobbin endwise alternately backwards and forwards by means of a cam upon a lever. The machine is actuated from a shaft, which is situated underneath it, and may be revolved by means of treadles coupled to cranks, actuated by the spinner or by other motive power. The bobbin is fitted with a friction strap to regulatelihe rate of coiling the twisted tobacco.—Patent completed.

of coiling the twisted tobacco.—Patent completed.

2965 F. B. Dereing, Victoria Chambers, S.W. Borisg rock, &c. Dated September 26, 1868.

This consists, first, in regulating (by means of a piston valve, or other form of valve or cock), the supply of water or other fluid (preferably an incompressible fluid) to, and the outlet of such fluid from, a cylinder, or a pair of cylinders, attached and adjacent to the main cylinder. The valve is worked by a piston in a cylinder in the manner described in the specification of letters patent, dated June 10, 1867, No. 1704, by motive fluid distributed from the main cylinder to the small cylinder, the piston of which is connected to the valve. Instead of attaching the adjacent cylinders to the boring cylinder, the piston or pistons of such adjacent cylinder or cylinders may be attached to the working or boring cylinder, the sdjacent cylinder in this case being fixed. The adjacent cylinders have each a fixed piston, and a supply of compressed air or other motive fluid may be maintained at its front, so much of each of the cylinders as is behind the piston o



pistons being filled with water or other fluid. A tube leads pistons being filled with water or other fluid. A tube leads from the piston valve to a reservoir containing the water. Second, in an improved mode of securing the tool in the end of the piston rod. For this purpose, the end of the piston rod or socket is threaded to receive a nut, and the position for the ordinary key is made adjustable, the nut is screwed up, and the key which jams against it is driven in; wear is thus compensated for, and washers dispensed with. In some cases, grooves are formed in the nut to in; In some cases, grooves are formed in the nut to the edge of the key; the nut is thus prevented turning .- Patent completed.

2967 J. Shepperd, Whitfield. Furnaces. Dated September 28, 1868.

This consists in the use of an escapement wheel with This consists in the use of an escapement wheel with pallets and pendulum, as in the common clock; the escapement wheel works loose on the end of a drum or barrel carrying a ratchet wheel, the ratchet being attached to the said escapement wheel. A cord is wound on the said drum or barrel, one part of which passes to the damper and moves the same by the use of a lever and pulley; the other part of the cord passes over a pulley or pulleys to the stoke hole, and has a weight attached thereto to act through the mechanism on the damper and gradually close the same, but not entirely shut off the draft.—Patent abandoned.

abandoned.

2968 C. D. ABEL, Southampton-buildings. Converting cast into wrought iron. (A communication). Dated September 28, 1868.

The fluid cast iron, whether direct from the blast furnace, or remelted, is taken and poured into a suitable receptacle in a stream, the flow of which is so regulated that the oxides (say, iron ore or cinder, or any other convenient and suitable oxidizing substance), can be stirred or mixed into it. The fluid metal will rapidly become pasty, and then solid, so that it is important to perform the operation quickly, and if the hardening is inconveniently rapid the oxide should be used hot.—Patent abandoned.

rapid the oxide should be used hot.—Patent abandoned.

2869 W. M'ADAM, Glasgow. Omnibus traffic. Dated
September 28, 1868.

This relates to tramways, wheels, and carriages. The
tramway is composed of wrought iron, malleable cast
iron, or steel plates or rails, laid in shallow grooves formed
for them in the roadway, whether such roadway is paved
with stone or wood, or is macadamized. The improved
wheel is formed with what may be termed a stepped tyre,
that is, having one part of one diameter and the other
part of a greater diameter. The part of smaller diameter
is for running on the raised surface of the improved rail,
and the larger part acts as a flange to keep the wheel on
the rail. The improvement in carriages consists in making the body of the carriage separate from the frame or
bogic which rests immediately on the wheels, and in
arranging the parts so that the body may be turned as on
a turntable.—Patent completed.

2370 J. Gregory, Bristol. Preparation of animal char-

2970 J. GREGORY, Bristol. Preparation of animal charcoal. Dated September 28, 1868.

This relates to an improved construction of retort. The retort is constructed by inserting in a revolving heating cylinder a plate, or series of plates, having perforations therein of a rectangular or other suitable shape, made in direction tables to the form the series of the suitable shape. a direction inclined from the axis of the cylinder. completed.

a direction inclined from the axis of the cylinder.—Patent completed.

2971 G. A. C. Bremme, Liverpool. Univisiting strands. Dated September 28, 1868.

This relates, first, to untwisting strands and other twisted or spun materials. Second, to feeding untwisted or non-twisted strands to backle or dressing cylinders; and, third, to dressing, combing, or picking the materials or three. The machinery for untwisting consists of a rotary feeder, composed of parts about to be explained. Two untwisting rollers are mounted in a frame which rotates on its axis at right angles, or nearly so, to the axis of the rollers; the journals of the frame, one at each side of the rollers, are hollow. On the axis of one roller right and left handed worm wheels are keyed; these wheels reach into pockets, one of which holds the corresponding worms or screws, on which is fastened a toothed wheel gearing into another wheel fixed on the pedestal of the hollow journals. The machinery for dressing, combing, or picking the fibres consists of two or more backle combe carried by side plates on a rotating shaft, and each provided with a hinged cover having holes or slots for the teeth to pass through. The dressing of combing machine will in most cases be combined with the rotary feeder before described, the fibre passing directly from the discharging journal of the latter to the backle teeth, and the hollow journals being driven by gearing and straps from the cylinder or comb shaft, or from counter shafts, if several machines are arranged in a row.—Patent completed. pleted.

2972 R. DUNCAN, Billericay. Earth closets. Dated September 28, 1868.

tember 28, 1868.

The patentee provides the earth reservoir or hopper with trunnions at its upper part, by which he suspends the hopper in bearings at the back part of the casing above the level of the seat. This reservoir or hopper he further provides with a double bottom, the one being placed a few inches above the other, and the false bottom having a central aperture through which the earth falls on to the lower bottom of the hopper, forming a heap, the flow of earth ceasing automatically when it rises to a level with the aperture in the false bottom. An opening is also made in the front of the hopper at the lower part below the false bottom, and just below the level of the seat, which opening he prefers to provide with a shoot for guiding the earth downwards on to the soil.—Patent completed. pleted.

2973 J. ROBINSON, Heston. Ploughs. Dated Septem

ber 28, 1868.

The cultivating tine or grubber is carried between the handles or yokes, and immediately behind the body of the plough. The tine or grubber is arranged so that it can rock in between the yokes, and from it, near its lower end, a draft chain or rod is passed to the beam of the plough, to a point in front of the body or frame.—Patent completed.

2974 T. Briggs, Manchester. Metal bands. Dated September 29, 1868.

This consists in connecting the ends of metal bands by punching at each end thereof two or more longitudinal slits with corresponding projections and recesses; these projections and recesses fit each other, leaving a transverse slot open between them, through which a key or cotter is driven, thereby connecting the ends of the bands. Also in punching one or more slots in the ends of the band; these

slots are larger at one end than the other; studs with flat heads are introduced in each slot to connect the ends of the band. Also in certain improved appuratus for punch-ing and bending the ends of the metal.—Patent completed.

THE

2975 J. SMITH, Manchester. Weaving and cutting fustions.

2975 J. SMITH, Manchester. Weaving and cutting fustians. Dated September 29, 1868.

This relates to patent, No. 837, dated April 4, 1864, and consists in working the rod by a hydraulic or other pump acting on a piston fixed to the end of the said rod, or on the end of the rod itself; this pump is worked by a cam or tappet. The second part of the invention consists in the application of fluied or toothed rollers to the taking-up motion of looms.—Patent completed.

2976 J. Wadsworth, Manchester. Utilizing heat of store, &c. Dated September 29, 1868.

The patentee makes a casing or framework of sheetiron rother metal, in the inside of which he fixes a door or shutter near the centre, working or swivelling on pivots, supported at each end by the framework or casing to the upper edge, and at one end of the shutter or door he attaches a connecting rod, by means of which such door or shutter can be opened or partially closed at pleasure. This apparatus he fixes in the flue of the chimney above the fireplace, so that when fixed, the door or shutter can be opened or partially closed by the connecting rod, which hangs down by the side of the fireplace, and when the fire is kindled, the door or shutter can be opened or or shutter can be partially closed, and thus reduce the area of the flue, and prevent an excessive current of air from rushing up the chimney and carrying with it the heat from the lire.—Patent completed.

heat from the fire.—Patent completed.

2977 W. E. Geder, Wellington-street. \*\*Reimming apparatus.\* (A communication). Dated September 29, 1868.

This apparatus is a belt, which is placed under the arms, and buckles over the stomach and belly. It is composed of two tin boxes, hermetically closed; the two boxes are tied together by means of a tinued iron plate, placed at the back of the apparatus, and secured by three rings. A small rod or iron wire pin is inserted in these three rings, to unite the two boxes indissolubly together. A double belt, such as those used for gymnastic exercises, forms the front of the apparatus, and permits its being fitted as close as may be desired to the body of the person using it. This belt, by reason of the shape of the apparatus, does not pass all round the interior, but is fixed on each of the two boxes to a vertical strip of tinned iron.—Patent completed.

2978 A. M. Clark, Chancery-lane. \*\*Raising and lovering\*\*

2978 A. M. CLARK Chancery-lane. Raising and lowering cithis. (A communication). Dated September 29, 1868.

2978 A. M. CLARK. Chancery-lane. Rating and lowering weights. (A communication). Dated September 29, 1868. This consists of a wood or metal framing, carrying the various parts of the apparatus, a crank handle or handles for imparting motion to the apparatus by hand, for which wheel driving gear may be substituted, and of friction rollers mounted loosely on the tripled cranked shaft, each of the cranks supporting a lever. These levers are provided with plates carrying weights, the position of which is adjusted according to the weight to be raised or power to be produced. Each lever is also provided with a pawl or catch, which are caused to act on ratchets keyed on the shaft.—Patent completed. Patent completed.

duced. Each lever is also provided with a pawl or catch, which are caused to act on ratchets keyed on the shaft.—Patent compieted.

2979 J. T. Irwin, Chicago, U.S.A. Illuminating apparatus. Dated September 29, 1868.

This relates to the combination with the burner of a lamp or lantern of a tube or tubes, so constructed and arranged that a current of air generated by the flame is caused to imping upon the flame, and promote a more perfect combustion, particularly from oils which are rich in carbon; second, to the combination with the burner, and with the conducting device above mentioned, of a globe; third, in the combination with the burner, and with the conducting device above mentioned, of a chamber placed near the base of the burner; fourth, in the arrangement of the conducting tubes above mentioned in such a manner as to form guards for the protection of the globe; fith, in the construction and combination with the conducting tubes above mentioned, a globe or its equivalent and a horizontal plate or a plate, inclining upward towards the centre, and perforated with small holes; seventh, in the combination with the burner, the conducting tubes and the globe or its equivalent to be raised up from the seat without disconnecting it from the conducting tubes; eighth, in the formation of the sides of the cap or the lantern with an inwardly and upwardly projecting flange at the top; ninth, in the combination with the sides of the cap of the lantern of a top plate or dome larger in diameter than the sides of the cap; tenth, in forming the sides of the cap of the lantern with projections made in one piece with it, and securing those projections in holes in the dome.—Patent completed.

2980 E. T. Hughes, Chancery-lane. Gas burners. (A communication). Dated September 29, 1868.

This consists in the arrangement of a rod of suitable material placed in such relative position to the flame, and indirect or indirect connection with the valve, so that the heat of the flame expands the rod to hold open the supply of gas, and s

2981 A. H. BRANDON, Paris. Watch-case spring. Dated

2981 A. H. BRANDON, Paris. Watch-case spring. Dated September 29, 1868.

This consists in replacing the two springs usually employed for the catch and springing of the cover by one spring, which said spring its into the case by its own elasticity, and does not require, as in the use of two springs, to be fitted into the case and fastened by screws screwed into the case.—Patent completed.

2982 I. Tearry Patelliar Damping and making pages.

screwed into the case.—Patent completed.

2982 J. Foster, Halifax. Damping and making paper for cartridges. Dated September 29, 1868.

This relates to a patent, dated August 28, 1866, No. 2218.

The patentee constructs a machine consisting of suitable framework, on which, at one end, is mounted a winsel or pair of conical studs to receive and support a roll of the paper; also at the other end is another winsel to which rotary motion is given, so that the paper may be unrolled from the first winsel upon the second. Between each of these winsels is mounted a cylindrical brush, or a roller covered with felt, or other absorbent material, and under it is a vessel to contain water, both of which are attached to a lever and stop rod, and hinged so that the roller may readily be placed in or out of contact with the paper whon starting and stopping the machine.—Patent completed.

2083 A. V. Newton, Chancery-lane. Boots and shoes.

2983 A. V. Newton, Chancery-lane. Roots and thoes. (A communication). Dated September 29, 1868.
Horn is employed in place of leather in the manufacture of boot and shoe seles. The soles, with or without raised

heels, are moulded into the desired shape by the aid of metal dies and mechanical pressure, after the manner usually employed in moulding buttons and other articles in horn.—Patent completed.

in horn.—Patent completed.

2934 W. HALLAM and H. J. MADGE, Swanses. Utilizing
tin shearings. Dated September 29, 1868.

The shearings are packed in frames or boxes of any
convenient or suitable size and form, and then apply
pressure to the shearings by a plunger or otherwise, to
render the bundles compact. The patentees next secure the
now compressed bundles with bands of wire or selected
strips of the shearings, having laid these bands within and
transversely of the frames or boxes before packing in the
shearings. The bundles thus made and secured are placed
alone and naked in a balling or other suitable furnace,

strips of the shearings, having laid these bands within and transversely of the frames or boxes before packing in the shearings. The bundles thus made and secured are placed alone and naked in a balling or other suitable furnace, bringing them to a welding heat. The heated masses are now quickly submitted to a squeezer or hammer, and thereby form them into a bloom, which bloom is at once passed through the rolls of an adjacent rolling mill and converted into a bar.—Patent completed.

2985 L. HANNART and N. A. AUBERT, Clerkenwell Moviding dixes for letters, &c. Dated September 29, 1869.

The bottom of the tool consists of a circular flat plate of metal upon which rests loosely another circular plate of metal of smaller diameter than the former plate; this smaller plate is formed with a fillet about its upper edge to serve as a shoulder for the engraved dies to be forced against, and thereby to bring the segmental dies close together, so as to form them into an entire circular die or mould; these segmental dies are each connected by a serow to the bottom plate of the mould, the heads of the said screws, each taking into an oblique slot or groove formed in the said plate; grooves or slots are also formed in the filleted plate above mentioned, radiating from the centre thereof, and into each of these radial slots a pin takes.—Patent abandoned.

2986 H. J. and J. W. GIRDLESTOR, Westminster. Pre-

takes.—Patent abandoned.

2986 H. J. and J. W. GIRDLESTONE, Westminster. Preventing compass deviations. Dated September 29, 1868.

This relates to the depolarization or neutralization of the magnetism of iron ships. For this purpose the patentees employ either an elastic spiral or spirals with battery and apparatus, such as that described in the specification of a patent dated September 13, 1867, No. 2592; or electro-magnets with a battery or ordinary horse shoe or permanent magnets.—Patent abandoned.

2987 E. HORTON, Birmingham. Chandelters and gas filtings. Dated September 29, 1868.

This consists in making the pulley wheels, rosettes, and balance weights, and the other parts used in the construction of chandeliers and gas fittings, of glazed vitreous earthenware, instead of making the same parts of metal, as is now customary.—Patent completed.

2988 G. DAWS, Penge. Opening and closing gates. Dated

2988 G. DAWS, Penge. Opening and closing gates. Dated September 30, 1868.
This relates to patent, No. 369, dated February 9, 1867. One of the posts of the gates to which the power is applied carries a pulley, as described in the specification of the patent before referred to. A chain or wire rope passes round the pulley, one end of which is led over another pulley with a weight attached; the other end of the chain goes to one arm of a bell crank lever, the other arm of which has a chain or wire rope attached, leading to a crank on the other side of the line of rails. A stud, by preference T-headed, is fitted to each of these bell cranks, and takes into a slot or slotted link, united to rods extending along the line of rails. One of the rods or series of rods extends along the line for, say, a quarter of a mile, where it is united or joined to a notched plate, resting on a suitable bed, and on which, at certain times, it is free to slide. A chain is connected to the other end of this plate, passing over a quadrant lever.—Patent completed. pleted.

pleted.

2989 W. GADD and J. MOORE, Manchester. Looms.
Dated September 30, 1868.

This consists in an improved method of regulating the amount of tension in the warp after it has left the warp beam. The warp beam, as most usually constructed, is fitted at each end with a pulley or an equivalent thereto, around which is coiled two or more "turns" of a rope band, or chain, one end of the band being connected to a spring, and the other end to a weighted lever, or to a second spring. The strain on the said band requires to be decreased at intervals during the weaving, as is well understood. The invention relates more particularly to those arrangements in which spiral springs are employed to strain the bands.—Patent completed.

2990 H. JRWITT. Kentish Town. New came. "silver chimes."

those arrangements in which spiral springs are employed to strain the bands.—Patent completed.

2990 H. Jewitt, Kentish Town. New game, "silver chimes."
(A communication). Dated September 30, 1868.

This relates to means and sparatus for playing a new game, called "silver chimes," and consists in placing rings, hoops, or gateways having swinging targets and bells attached thereto, around a central flagstaff on a lawn or (for an indoor game) on a table or board provided for the purpose. Any convenient number of players in turn strike or propel balls, which may be painted or stained with various colours, from concave wedges driven into the lawn, or from the surface of the said board or lawn by mallets or maces, which may be also painted or stained. The said balls are struck, when required, in the direction of, and so that they may pass through the rings, which have targets upon them, furnished with a bell or bells, caused to ring by the ball striking such targets or disca. Suitable mottoes, sentences, or devices are also statched thereto or inscribed thereon. The flag or banner (also having a suitable motto or device thereon) is placed at any convenient part of the board, table, lawn, or other place where the game is employed.—Patent completed.

2991 V. Jugi. Nice, France, Propelling, steering, and

place where the game is employed.—Fatent completed.

2991 V. Jugl. Nice, France. Propelling, steering, and
turning ships. Dated September 30, 1868.
This consists in forcing a jet or jets of water in a contrary direction to the desired course of the ship or vessel.
A cylindrical or other shaped chamber, in which works
an air and water-tight pistou, is placed at a suitable distance below the water-line of the ship or vessel, and a
reciprocating motion is imparted to the piston by a steam
engine or other motive power.—Patent completed.

2992 J. MABSON, Norwood. Candlesticks. Dated Sep-

2992 J. Masson, Norwood. Candleticks. Dated September 30, 1868.

An upright spindle or rod, formed at its lower end into a male screw, carries on the top a cup, or socket, or plate, with a vertical pin or point to receive the candle. Clips are fastened at the upper part of the spindle. On the spindle, below the clips, is a nut or threaded collar, which, when screwed up, causes the clips to close and embrace the lower part of the candle.—Patent completed.



2996 J. LAMBERT, Norwich. Raising easter. Dated Septicher 30, 1868.

As the top of the suction pipe is fixed a valve opening into a space or chamber between this valve and another above it, fixed in the top of a hollow air-tight plunger, forming a cylindrical sir-tight chamber, closed at top and bottom, and encircling the suction pipe, but of such diameter as to leave a space for water between the outer surface of the esid chamber and the interior of the outer cylinder or pump barrel.—Patent completed.

2994 A. LAFAYNE, Newcestle-upon-Tyne. *Sice* ated September 30, 1868.

2994 A. LAPANE, Newcastle-upon-Tyne. Steam gauges. Dated September 30, 1868.
The fiuld, the pressure of which is to be indicated, acts in a cylinder upon a piston or plungar, the rod of which, by rack and pinion or otherwise, operates a pointer, and at the same time by arms and pulleys or studs; the piston rod acts on weighted levers, causing them to move from a position vertical or nearly so to a horisontal one, dependent on the pressure applied in relation to the weights of the lever.—Patent completed.

2995 W. RIGHARDON, Oldham. Classing seed, &c.
Dated September 30, 1868.
This consists of a series of prongs or spikes, to which a
reciprocating or travelling motion is imparted, while, at
the same time, they are caused, during their forward
movement, to rise through a grid, on which the material
rests, and then to be withdrawn therefrom.—Patent completed.

movement, to ruse throngs a grie, on which such associated rests, and then to be withdrawn therefrom.—Patent completed.

2996 W. E. Newton, Chancery-lane. Treating metals. Dated September 20, 1868.

This relates to treating metals so as to remove from them phosphorus, sulphur and silics. A suitable furnace is first constructed, with a proper vessel set therein, in which to treat and fuse the material used for this purpose, which is the cyanide of potassium or other fusible compound, containing cyanogen, combined with one or more metals together, with one or more of the compounds of sodium or potassium, such as the chloride of sodium, the carbonate of sods, and the biborate of sods, or the carbonate of potassium is used, by preference, with the chloride of potassium is used, by preference, with the chloride of sodium, say, about 90 parts of the former to 10 parts of the latter. Into the above-mentioned vessel his mixture is put, and then sufficient heat is applied to the vessel to fuse the material and bring it to red heat. The metal is then submerged in the liquid and allowed to remain a sufficient period of time to thoroughly personate the metal. The metal is, lastly, removed from the vessel and the foreign matter adhering to it dissolved of.—Patent completed.

completed.

2997 W. E. NEWYON, Chancery-lane. Solvers sharpener.
(A communication.) Dated September 30, 1868.

This consists in a bevel-edged circular file combined and arranged with a circular guide-piece, so that on the sharpener being held firmly by the forefinger and thumb of one hand, applied to the edges of a hole made through its centre, or other convenient manner, the blades of the scissors may successively be sharpened by drawing their bevelled sides across the cutting surfaces of the file, while the guide-piece serves to guide the first side of the blade and restrain the latter from slipping off the sharpener.

—Patent completed.

2908 J. H. JOHNSON, Lincoln's Inn. Manufacture of sabile.

Patent completed.

2008 J. H. JOHNSON, Linnoln's Inn. Massufacture of white lead. (A communication.) Dated September 30, 1862.

This scendsts, first, in subjecting metallic lead to the action of carbonic acid gas in a close chamber, and then to a spray of dilute sectic acid, the gas being at such a temperature that a proper degree of heat is maintained within the chamber, without the nue of heating apparatus. The metallic lead, during its process of conversion into a carbonate, is subjected to solutions of chloride of sods and carbonate of sods, while in the same chamber, which is lined with slate, glass, or other material, capable of resisting the sotion of the acids. Second, in the application of the above improvements, in whole or in part, to the Dutch process of manufacturing white lead, by injecting into the spaces within the beds occupied by the pots, steam carbonic acid gas. Third, in producing from the waste products of combustion a pure carbonic acid gas.—Patent completed.

2009 G. A. F. E. DALEYMPLE, Logic, Elphinstone, N.B.

combustion a pure carbonic acid gas.—Patent completed.

2999 G. A. F. E. DAILETRIFIE, Logic, Elphinstone, N.B.
Cupping horse, &c. Dated September 30, 1868.

This consists of a revolving knife or knives, which may
be circular or in the form of segments of a circle. The
knife or knives is or are placed in a metal case, the edges
of which are formed at the front or conting side into teeth
or fingers. These teeth or fingers are blunt at the point,
but the inside edges are sharpened towards the inside of
the case, so thest when the instrument is pushed forward
by the operator, who acids the machine by a handle, the
hair or wood is divided by the teeth and out by the circular
or segmental knife or knives, which revolve on an axis,
sitted with a driving pulley, actuated by a cord or band,
which passes through the handle of the apparatus.—
Patent absandened.

Patent shandconed.

3000 O. W. Powers, Regent street, W. Saving machines. (A communication.) Dated September 30, 1868.

A case or box, containing the necessary machinery for producing the auxiliary power, is fitted beneath the table, and on the ordinary main shaft, which carries the flywheel, there is provided a clutch which alides on such shaft, and arevolves therewith. A pinion, mounted on the main shaft, gears into one of the wheels inside the case, such pinion being loose on the shaft, except when in contact with the slutch. The clutch is worked by any ordinary clutch lawer, which works on a centre in the side or and of the case. This leaves also has an erm, which arrests the transmission of anylliary power when the clutch is moved away from the pinion. The surillary power may ansats of a drum or barrel containing a spring, in combination with which is a ratebet and stop gear, to prevent the spring from being overwound.—Patent shandcomed.

abandoned.

2001 J. WOOLLATT and W. B. DODDE, Gravesend. Moties power. Dated September 20, 1868.

The patentees employ a main lever or beam, rocking on an axis at its centre. To each end of the main lever or beam a connecting rod is jointed, and these rods complet the beam with a combination of bell crank levers and weights, arranged in such manner that the weight at each end of the beam is effective to urge the engine forward during the descending stroke, and is released during the according stroke.—Fatent completed.

2002 G. THENE. Shaffield. Recomment contribles case.

e G. Cuspon, Shattletd. Recopping contridge ages. for a superior se, 1865.

ridge case. One side of this tube has clamping jaws or arms standing out from it, so that the apparatus may be clamped to the edge of a table. Standing out sideways from the upper end of the tube, is an arm carrying a pin, which forms a fulcrum for the end of a lever. The pin passes through a slot in the lever, in order that a projection on the lever may either be caused to bear upon the brass top or base of a cartridge case, piaced within the tube of the apparatus, or else upon the cap which is to be forced down into the recess in the centre of its base. Within the exterior tube of the apparatus is soldered or fixed an inner tube.—Patent abandoned.

2008 B. W. STEVENS, Birmingham. Plobe spindles for losses. Dated September 30, 1868.

This consists in making the said picker spindles or guide bers hollow, that is, of tabes of iron instead of solid bars, and in coating or covering the said hollow or tubular iros spindles or guide bars with gless or enamel. The tubular spindles or guide bars are made from long pieces of iron tubular, made in the ordinary way, and cut into the sequired lengths before being covered or coated with glass or enamel.—Patent completed.

or enamel.—Patent completed.

3004 A. T. BEUES and G. JOHNSON, Birmingham. Measufacture of rouge. Dated September 30, 1863.
This consists in the manufacture of rouge and polishing
powders from waste iron solutions. To the waste iron
solutions, sikalies or alkaline earths are added in sufficient
quantity to neutralize the acid, and precipitate the oxide
of iron from the solution. Soda lime or ammonis are
preferably used for this purpose. After the alkali or alkaline earth has been added to the waste iron solution, it no
longer produces a further precipitate, the solution is
allowed to remain at rest, until the precipitate has subalded, and the clear liquid can be removed by decentation.

—Patent abandoned.

3005 T. FISHER, Little Hord. Supporting rollers for bid

3005 T. Fisher, Little liftord. Supporting rollers for blinds. Dated October 1, 1868.
This consists chiefly in the peculiar construction of a device, which is used instead of the ordinary pulleys and blanks for carrying the pivots of the rollers. The device is constructed with a centre pin or pivot on one side, which is fitted to turn in a suitable bracket or bearing of any convenient form. The other side of the said device is provided with a socket to receive the end of the roller, the centre of the socket being made eccentric to the centre pin or pivot. If desired, instead of the socket, the pulley may be provided with other means for holding the roller eccentrically te the pivots.—Patent abandoned.

he provided with other means for holding the roller eccentrically to the pivots.—Patent abandored.

3006 H. Highton, Brighton. Manufacture of artificial stone. Dated October 1, 1888, This relates to a previous patent, dated June 25, 1888, No. 2048. The block, slab, or slate is first moulded or cast in hydranile mortar or cement, mixed, if desired, with sand, gravel, or other substance, as described in the specification of the patent referred to. Sometimes hair or fibre, or pieces of metal, are mixed with the mortar or cement, to render the articles made from it more tough, and to lessen their liability to break. After the block, slab, or other slate is set, the surface is washed over with a wash prepared with any durable pigment which is able to resist the action of caustic lime. Lamp black, othre, ultramarine, and red oxide of iron, are surfable. The pigment is mixed with lime and water, so as to make a weah of a consistency like that of the Hime wash used for common hime whiting. The proportion of hime to the pigment may be varied according to the tint which it is desired to obtain, but it is best that the proportion of hime should not be less than about one part to one part of pigment. In order to close the pores on the surface of artificial stone, slate, or natural stone, bricks, wood, or other porous substance, so as to render such substance capable of decomposing the silicate and combining with the soda, so as to form an insoluble compound therewith. Bilicate of sods and antimomic acid are thus employed.—Patent completed.

2007 G. T. BOUSPIELD, Brixton. Manufacture of pile fabrics. (A communication). Dated October 1, 1886.

and combining with the sods, so as to form an insoluble compound therewith. Silicate of cods and antimonic acid are thus employed.—Patent completed.

2007 G. T. BOUSTELD, Brixton. Mass/scierc of pile febrics. (A communication). Dated October 1, 1868.

This consists, first, in the production of a tufted fabric wherein the body is composed of feit, and the tufts projecting therefrom are but slightly feited, the tufts being united with the body and forming a part of the fabric by the process of feiting during the felting of the body of the fabric. Second, in producing a tufted fabric whereis tufts which have been introduced in a back of previously manufactured cloth, either woven or feited through perforations in the same, are secured by a process of felting either with or without having an additional back felted to the fabric. Third, in the use of the tuft holder for holding the tufts and supporting the body of the fabric, in combination with the "figgring" apparatus, whereby the tufts and body of the fabric are properly prepared and felted together. Fourth, in the employment of a "tufting punch" or punches, substantially as hereinbefore described, in combination with a tuft holder in a felting machine, for the purpose of preparing a tufted fabric with tufts from bats. Fifth, in the combination in a felting machine, for the purpose of preparing a tufted fabric with tufts from parase or revings. Bighth, in the combination of appliadrical tuft holder, the tuft unches the plaiter, and preseer plate, in order to prepare a tufted fabric with tufts from bats. Seventh, in the employment of one or more tufting needles in combination with a tuft holder is a felting machine, with the tuft holder, the tuft punches the plaiter, and preseer plate, and tufting punches, with the mechanism described for operating the devices in order to prepare a tufted fabric with tufts from parase or revings.—Ferent completed.

2008 J. D. Soller, preseer plate, tufting needles, and their feeding mechanism described. Tenth, the combination of a

rovings.—Patent completed.

2008 J. D. SCALLY, Burton-on-Trent. Filling casks.

This sensists of a bung or stopper fitting into the bung-hele of the cask, and having a finnge or lugs upon it to sessition. This bung or stopper also has two tubes passing through it. The beer or liquid is admitted to the cask through the larger of these tubes, and the other serves for the engage of the air from the cask. By means of a familie sipe of sufficient length to allow the apparatus to be maddly fixed in the cask and ramoved therefrom, the

larger tube is connected with a cock, by which the beer is withdrawn from the supply tank or vessel from which the casks are to be filled. The air pipe also, by a flexible connection, is coupled with a stand pipe fixed to the cui-ride of the tank or vessel, and rising above the level of the liquid therein. The apparatus being fixed in the cask, and the bung or stopper fitting the bung hole sirright, the cock is turned on so that the beer or liquid may pass from the filling tank or vessel down the larger tube into the cask, and this it does so long as the air can escape from the cask up the air tube, but as soon as the ead of the air tube is covered by the liquid in the cask the flow is stopped.—Patent completed.

flow is stopped.—Patent completed.

3009 J. F. G. KROMSCHREIDER, Camden Town. Generating displanemable gen. Dated October 1, 1868.

Clookwork is employed to give motion to an air-foreing apparatus, which forces atmospheric air into a chamber forming part of the same apparatus consining a volatile hydrocarbon oil. The apparatus is so arranged that an extansive surface of the volatile oil is exposed to the air. The air is led from the chamber by a flexible pipe or otherwise to the burner or burners at which it is to be burner, and by a stop-cook the size of the flame is actuated. The clookwork is 'actuated by means of a spring which operates through a funce so as to maintain a uniform action as the tension of the spring varies.—Patent completed.

2010 J. MURRAY and O. HARLING, Keighley. Consuming smoke. Dated October 1, 1868.

This consists in the application and use of a fan placed in any convenient part of, or in connection with, the fine leading from the boiler or furnace to the chimney, so that it will produce a draught to draw away the smoke and gases therefrom, and force the same through or into water supplied to a tank or vessel placed in the bottom of the chimney or flue. One or more jets of steam are inserted into the flue or pipe leading from the furnace to the fan, and from the fan to the water tank.—Patent abandoned.

and from the fan to the water tank.—Petent shandomed.

3011 D. CRICHTON, W. DONAVAND, and D. CRICHTON Manchester. Looms. Dated October 1, 1868.

This consists in improved arrangements for diminishing the friction of the swells on the shuttle, and for regulating the movement of the shuttle in the process of weaving. To each swell in the single shuttle baxes a supplementary spring action, or its equivalent, is applied for steadying the shuttle when in the boxes, and certain mechanical movements put in operation by the working of one of the crank arms of the lathe are also employed for the purpose of taking off the stop rod pressure from the swells shortly before the shuttle is ejected from the boxes by the pickers. The action of the supplementary spring is to keep the shuttle steady in the box by slight pressure at the time the main pressure is withdrawn from the swells to receive the picker stroke, and also to regulate the action of the shuttle across the race board, and at the same time to allow the required pressure to be given to the swell when the shuttle arrives in the opposite box.—Patent completed.

3012 C. B. CHARDON. King William-aircest. E.C. Less.

completed.

3012 C. B. CHARDON, King William-street, E.C. Lassscotice engines. Dated October 1, 1868.

This consists in constructing the drawing wheels of
locomotive engines with projecting pieces fixed to their
peripheries at equal distances assumder. It is proposed to
couple the front and back driving wheels together by
toothed gearing, and also, if necessary, to fix springs
between each of the aforesaid projecting pieces. The
springs, which are formed endless, nearly fill the space
between one projecting pieces and the next, so that the
outer cerface of the said spring describes a circle with the
ef-resaid projecting pieces, and is flush therewith.—Patent
abandoned.

3014 J. OLIVIER, Paris: Motive power. Dated October 1,

1868.
This relates to the use of the wind as a motive power. The wheel or motor upon which the wind acts is formed with vanes, belicoids, winding surfaces, or inclined planes, more or less in number, according to the size of the wheel, and so arranged as to utilize as completely as possible the motive power of the wind. These vanes are attached to a vertical main driving shaft by two or more horizontal plates keyed on the shaft, or by a suitable number of arms.—Patent abandoned.

horisontal plates keyed on the shaft, or by a suitable number of arms.—Patent abandoned.

2015 A. TRORPR, Codnor. Chairs and cages for sales.
Dated Cotober 1, 1868.

The improved chair, cage, or hoist is provided at each side with a perpendicular bar. To each of these bars, near their upper and lower ends, are secured the usual cilp plates or shoes which slide upon the ways or guide rods of the mine or lift above the upper clip plates. On each side of the cage is a pair of cams, or their equivalent, and between these cams, or, their equivalent, the guide rods of the mine or lift ile. To each corner of the cage is attached a strong chain; these chains are connected together above the top of the cage by a ring, to which is attached a fifth chain lying over the centre of the top of the cage. To this short chain is secured the centre of another chain, each end of which is passed through one or more holes in the top or cover of the cage, the ends being secured to two bars, or to an open link, the lower ends of which are hinged upon a short bar which is passed through the curied end of the lower plate of a flat compound spring composed of several plates overlying each other. This spring is firmly secured at the centre of its length to the under side of the top or cover of the cage, and upon the outer ends of the short horizontal bars. At each end of the spring are fastened short levers, having their opposite ends working upon pins in the casms or their equivalent. The ring attached to the chains before mentioned is suspended to the hoisting chain or rope by means of two hooked plates which lie between two other plates.—Patent completed.

2018 W. E. NEWYON, Chancery-lane. Decreticating gross. (A communication). Dated October 1, 1868.

completed.

2016 W. E. NEWTON, Chancery-lane. Decertioning gross. (A communication). Dated October 1, 1868.

This consists in the employment of a new process for moistening or softening the outer cuticle of grain. An alkaline solution is employed, which consists of caustic soda dissolved in water in the proportions of about 1 part of soda to 20 parts of water.—Patent abandoned.

2017 W. B. LAKE, Southampton-buildings, W.C. Deer premes for furnaces. (A communication). Dated October 1, 4868.

This consists in constructing furnace door frames of steam boliers by turning the boiler plate inward and the furnace plate outward, and lapping and riveting the two plates tegether.—Patent completed.



2018 F. A. CALVERT, Manchester. Cleaning wools, &c. Dated October 2, 1868.

This consists, first, in the arrangement of burr cylinders and fluted guards, in combination with their respective brushes, for lifting the uncleaned fibres from the surface of the grate and carrying them back to the burr cylinder or cylinders. Second, in an improved mode of constructing toothed wire cylinders; and, lastly, in improved apparatus for grinding wire or toothed cylinders.—Patent completed.

ratus for grinning wire or toothed cylinders.—Patent completed.

3019 G. Holdbort and W. N. Dack, Manchester. Steam engises. Dated October 2, 1888.
This relates to a patent, dated December 11, 1867, No. 3512. In the present invention, the differential stop is connected to an eccentric rod or its equivalent, thereby causing the former to slide backwards and forwards with the latter. The eccentric may be set opposite to the crank by placing a plate, or having a facing with ports between the slide valve and the expansion valves. The invention further consists in varying the point of cut off by means of lever, one end of which is attached to, or in connection with, the spindle of the cut-off valve, or with the valve and the other end fixed. This lever passes between jaws on a sliding block. The invention also relates to the governor rod, which is made in two parts, each with a head acted upon by springs contained in a box where the variable stop of expansion gears, is in contact with the stops connected to the valve spindle or eccentric rod.—Patent abandoned.

Patent abandoned.

4020 J. F. and S. Jehrins, Birmingham. Eleme halt.
Dated Cotober 2, 1868.

The body of the link consists of a plate or bar of metal, at one end of which is fixed a vertical pin, the other end being provided with an inclined groove or channel in which there is a hole or aperture perforated through the end of the plate or bar. A movable tongue, consisting of a bar of metal, the two ends of which are bent at right angles to its length, is mounted, by means of a suitable collar attached to or formed at one end of it, to the vertical pin, on which it is free to move horizontally, as on a pivot, until it is brought at right angles to the main plate.—Patent abandoned.

plate.—Patent abandoned.

3021 E. O'CONNELL, Greenwich. Feeding bottles. Dated October 2, 1868.

This relates to previous patents, dated April 25, 1858, No. 987, and October 6, 1859, No. 2274. It consists, first, in attaching to the joint at the end of the elastic tube leading from the bottle, a short flexible tubing of suitable diameter, either open at the extremity, or closed, to act as a valve, over which said tube an artificial test is placed. Second, in placing inside the cap or covering that fits over the neck of the bottle, a washer of india-rubber, or other suitable material, through a hole in the centre of which the elastic feeding tube passes, the material around the said hole having several radial slits made therein. Third, in making a shield or mouth guard of india-rubber or other elastic material. Fourth, in making around the said neck a series of rings, in order to cause the cap or cover to hold more firmly to the neck of the bottle.—Patent abandoned.

3022 A. MONENBERGUE, Paris. Kuns. Dated October 2,

3022 A. MONSNERGUE, Paris. Kilns. Dated October 2

1868. The improved kiln has a central fireplace, surmounted by a chimney, which may be heated by wood or by coal, and the fire of which may be constant or intermittent. The kiln has four independent compartments. In burning the material in the first compartment, the fire passes to the second, until the operation in the first is completed, and then air conduits above and in front of the kiln are opened, to cause the heat to spread in the other compartments where the burning or baking has already commenced. Of these four compartments, three are always full, and the other being charged or empited, this latter being separated from the fire, by means of dampers placed before the heat and smoke conduits.—Patent completed.

before the heat and smoke conduits.—Patent completed.

323 N. Histwoon, St. Germains. Moving and reaping.
Dated October 2, 1868.

A cutting wheel or circular saw plate is mounted so as
to work horisontally close to the ground against the standing crop. The saw is keyed to a vertical shaft working in
autitable bearings, and receiving rotary motion, by means
of 2 horisontal shaft and bevel gearing from the driving wheel of the machine. The cutting may be effected
either by means of a fine toothed saw, or by providing
fingers arranged in a semi-circle through which the larger
toothed saws would pass. At the upper end of the vertical
shaft is keyed a pinlon, gearing with an internal toothed
wheel keyed to an inclined shaft placed above the vertical
shaft before mentioned, and carrying a set of rakes to
which rotary motion is transmitted from the vertical shaft,
by means of the rack and pinlon before mentioned, for
laying the corn or grass in sheaf or swath.—Patent completed.

See4 R. F. Drury and J. E. and W. J. WALKER, Sheffield. Ratchel and crunt braces. Dated October 2, 1868. This consists principally in the application and use to and in crank and ratchet braces, lathes, and other tools or apparatus requiring "centres" or pivots of rotation of loose centres in lieu of fixed centres with the object of reducing friction, and thereby increasing the durability of the "centre." The improved "centre" may be made of steel, gam, or other suitable hard metal, alloy, or mineral substance; it is double pointed, the inner point being free to rotate in a female centre, either fixed or movable.—Patent completed. completed.

completed.

2026 C. E. BROGEAN, 166, Fleet-street, E.C. Hardening fatty matter. (A communication.) Dated October 2, 1825. This consists in the hardening of the fatty body incompletely; in the hardening of fatty matters which have first been more or less deprived of solid fatty matters; in the uninterrupted stirring or working up of the fatty matters to be hardened, and of the alkaline lyes until the end of the reaction; in the manner of making the reaction with quantities of lyes than 44 volumes, with the lyes boiling at 572deg, to one volume of fat; in the mixing of the fatty matter and the lyes at a temperature lower than 572deg.; in the treating of the mixture until the disengagement of hydrogen ceases, or until this disengagement in nearly terminated; in the destruction by calcination of the organic bodies contained in the lyes which have been used, and in afterwards recausitiying them for use again; in the regeneration, by means of lime of the alkalies contained in the soap, in place of them regenerating, by previous conversion into sulphates or chlorides according to the Leblanc-progress; in the transformation of the soluble poaps into calcarrons scape, under the missence of heat

and under pressure to facilitate the formation and separa-tion of the calcareous soap; in the employment of the residues of impure lyes for the manufacture of soft soap; in the employment of the calcareous hardened soap for the calcareous saponification of greases and fats; and in the application to the manufacture of candles, soaps, and colours of the fatty acids hardened and produced by the means referred to.—Patent completed.

means referred to.—Patent completed.

3027 T. C. Parson, jun., Bristol. Skates. Dated October 2, 1868.

The skate is fixed to the heel of the boot, by means of a movable lever attached to the end of the sole plate, which rorces the heel into fixed spikes, secured at the back of the heel plate, and is adjustable to any size. The sole plate is fastened by lateral movable stays, which can be adapted to any width. Attached to these is a leather band and buckle mossing over the foot, whereby, without any pressure, the skate is kept firmly in place. The sole and heel plates may be constructed in one piece, and made of any metal or wood.—Patent completed.

3028 E. F. Rose Provin France. Proving and pathing

any metal or wood.—Patent completed.

3028 E. F. Rosz. Provin, France. Breaking and pessing fax. &c. Dated Cocher 8, 1988.

This consists of a shaft on a forked rod, governed by loce and fixed pulleys. There are stripping or pealing rollers, which receive the substance from a grooved steel blade, placed horisontally between the uprights of the frame. Grooved rollers are placed before the blade, which are destined to peel and strip the filamentous substance, before it is subjected to the action of the blade. Three couples of rollers are made use of, which serve to break or crush the hemp or fax, and to deliver it to the peeling or stripping rollers. The rollers which command the other rollers receive motion from the eccentric shaft, by means of gear wheels.—Patent abandoned.

3029 J. SHEIMFTON, Redditth. Packing seedies. Dated.

3029 J. Shrimpton, Redditch. Packing needles. De

3029 J. Shrimpton, Redditch. Packing media. Dated October 3, 1868.

This consists in enclosing needles within the hollow or tube which is ordinarily pierced through a reel, upon which cotton, thread, or other sewing embroidery, or similar material, is sold. In adapting the reel to this purpose, the hollow or tube must be rendered impervious to damp, to effect which it is lined with paper or thin metal. One of the open ends of the hollow or tube is covered by a label, and prevents the escape of the needles at that end, whilst the other end is closed by a removable cap, made by proference of thin metal, attached by a single pivot or pin to the reel. The cap is formed with a small stud, to enable the cap to be turned by the finger upon its pivot, so as to answer that end of the tube, when it is required to insert or to take out a needle.—Patent completed.

\$000 J. Baker. Liverpool. Cleaning this bottoms. Dated

3030 J. BAKER, Liverpool. Cleaning ships' bottoms. Dated

3030 J. BAKER, Liverpool. Cleaning ships bottoms. Dated October 3, 1868.

This consists in a peculiar rotating brush, and in scrapers fixed spirally round a cylinder of wood or other suitable material. A cylinder of wood or other suitable material, asy about 6in. in diameter, and 6ft., or any other suitable length, is taken, and on this cylinder the piasasva or other fibre is fixed in rows of bristles, forming the brush. These fibres are preferably carried round the cylinder in a spiral form, parallel to each other. One end of the cylinder is formed, say, about 1ft, tapered or conical. The end of this is inserted into a truncated, conical, or cylindrical ferrule, to which is attached two, three, or any other required number of oblique blades, and the outer ends of the socket piece are fitted with a swivel, to receive a rope, to allow the cylindrical brush to rotate, when the same is drawn through the water or in a stream.—Pastent completed.

3031 J. ROGERS, Brooklyn, U.S.A. Reviews boxed black.

stream.—Patent completed.

3031 J. Rogers, Brooklyn, U.S.A. Reviving bone black.
(Partly a communication). Dated October 3, 1868.

This consists, first, in the after treatment of the exhausted bone black or animal charcoal, by neutralizing any excess of lime present, by the use of a solution of the superphosphate of lime. Second, in removing any excess of organic matter present in the exhausted bone black, by steeping it in a solution of nitrate of ammonia, and then reburning it.—Patent completed.

8032 D. WEST, Euston-square. Press. Dated October 3.

1868.

This consists in making both the bed and follower between which the bale of goods is to be compressed with concave surfaces, in order to mould the top and bottom of the bale under pressure to nearly the convex form, which the bale is desired to assume when taken from the press.

—Patent completed.

the bale is desired to assume when taken from the press,
—Patent completed.

3033 B. E. B. NEWLANDS, Charlton. Manufacture of
manure and salts of ammonta. Dated October 3, 1868.

This consists, first, in taking any organic matter containing nitrogen (such, for instance, as dried blood,
woollen waste, or leather clippings), and treating it with
vitriol or sulphuric acid, at an elevated temperature of
from about 300deg. to 400deg. Fab., and allowing the
mixture resulting to digest until the organic matter has
been thoroughly acted upon, and converted into a black
mass. To the substance resulting, native carbonate of
magnesia or magnesium (limestone, by preference), is
then added, in a state of fine division, so as to neutralize
the excess of acid. Second, in utilising the nitrogen contained in the impure sulphocyanide of ammonia
contained in the solution, and the ammonia it contains
distilled. This collected in an acid, such as sulphuric acid.
The sulphur cyanide of calcium remaining in the dissulphent and the sulphocyanide of calcium, the sulphuric acid.
The sulphur cyanide of calcium remaining in the dissubjected to dry distillation, and the ammonia evolved is
collected in an acid, by preference, sulphuric acid. The
invention further relates to, the conversion of the nitrogen
the purification of coal gas into ammonia, by dry distillation, either with salked or dry lime, as the case my
sube.—Patent completed.

3034 E. A. Cowper, Westminster. Manufacture of iron
and steel. Dated October 6, 1868.

be.—Patent completed.

8034 E. A. COWPER, Westminster. Manufacture of tron and steel. Dated October 6, 1868.

This consists of an improved apparatus, consisting of a float of cast iron, wrought iron, steel, clay, glass, glass of iron, or other refractory material, so formed as to retain or hold any chemical desired, to be applied to the iron or steel in a melted or semi-melted state, in order that such float may be set floating on the iron or steel, with the chemicals attached/or held to its underside, thus exposing a considerable surface of the chemicals to the iron or steel. The floats may be made of various forms, but a flat plate, with the edges turned down and roughened below, or with

with slight projections, to hold the chemicals wery well.—Patent completed.

wery well.—Patent completed.

3065 J. HOWDEN, Glargow. Preventing escape of heat Dated October 5, 1868.

The vessel or surface to be protected is surrounded wholly or partly by an envelope of sheet iron, wood, or other suitable material, placed at a distance apart from the surface equal to the thickness required for the son-conducting material. The placeter of Paris or similar substance is then made up in its liquid state, and run or poured into the space between the envelope and surface of the vessel until the space is filled.—Patent abandoned.

\*\*Acces B. Harryman and D. Harr. Manchester. [Riliston.]

2026 I. HEILMANN and P. HAIT, Mauchester, Utilizing chemical supports. Dated October 5, 1868.

For the purpose of absorbing certain fumes arising from chemical operations, the exides of calcium or magnesium or the carbonates of these exides are employed, either in solution or while suspended in water, any form of apparatus being used which may be found suitable; or the exides or their carbonates are used in the solid form, and enclosed in suitable vessels in the same way that metallic exides are commanly used for the purification of coal gas.

—Patent completed.

8037 J. B. JOYCE, Bradford. Values and couplings. Dated

3037 J. B. JOYOE, Bradford. Values and couplings. Dated October 5, 1868.

This relates, first, to means of setting or edjusting and working or operating those values of steam engines known as expansion or cut-off values, directly from or by the governor. The value employed is in two parts, one to each port, at the back of the ordinary slide values, which are attached to the value end by right and left handed sornew threads theseon. The rod is in two parts, jointed between the two parts of the value by a coupling. This coupling is in two parts, divided longitudinally; the interior is formed to fit on the rod, and the exterior slightly conical or tapering towards each end, from the middle thereof, and having a screw thread cut thereon. A screwed nut is fitted upon each end of this coupling, so that when the coupling is applied across the joining ends of the two parts of the rod or shaft these nuts can be scarred up. Second, to means of joining together lengths of mill shafting, bars, or piping of metal, or other material, and consists in the application of the hereinbefore described construction of couplings for such purposes.—Patentahandoned.

3068 W. R. LAKE, Southampton-buildings, Chancery

3068 W. R. LAKE, Southampton-buildings, Chancery inc. Chandeliers. (A communication.) Dated October 5

lane. Chandelier. (A communication.) Dated Ostobar's 1868.

There is attached to the top piece, in which indixed the ring or hook for suspending the chandeliers, a central rod, and closely coiled helical springs, three or more in number, are also attached at anitable points, beyond the said rod, and at equal distances therefrom. The bottom part of the chandelier, to which the lamps, candles, holders, or burners are attached, is provided with a vertical tubular stem, which surrounds the rod, and which depends from the top part. The long helical springs before named are attached to the bottom part of the chandelier, and are so proportioned to the weight of the bottom or movable part of the chandelier, that when such part is located about half way between its extreme points of movement, these is equilibrium. On the top of the chandelier tube a piece, serving for the fulcrum of a lever, is secured, one arm being perforated with a bole a little larger than the diameter of the rod before mentioned, while the other arm receives at its send a string, chain, or other means by which the position of the lever may be changed.—Patent abandoned.

8039 C. B. GALAND and A. SOMMERVILLE. Birmingham

changed.—Patent abandoned.

9039 C. B. GALAND and A. SOMMERVILLE, Birmingham Repeating freezems. Dated October 5, 1868.

In this invention both the revolving barrel or cylinder and fixed barrel are made capable of a sliding motion upon a rod, projecting axially from the face of the break-off or false breech of the pistol. Between the break-off and the rear end of the revolving barrel or cylinder a disc is placed, which has a series of holes in it, equal in number to the chambers of the barrel or cylinder. These holes are chambered out to receive the rims of the cartridges when the latter are placed in the chambers of the revolving cylinder. To the axis of the said disc a tube is fixed, which tube slides upon the axial rod hereinbefore described. The revolving barrel or cylinder is situated on and is capable of sliding upon the tube of the disc, the said revolving cylinder and tube being connected together by a sliding key on the said cylinder, working in a longitudinal elot in the said tube. By this arrangement the rotary motion which is given to the disc is communicated to the revolving cylinder.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT

Dated April 6, 1969.

1083 G. T. Bousfield, Loughborough Park, Brixton.

nprovements in the manufacture of paper, and in sizeing

Improvements in the manuscount thereof.

1034 G. T. Boussield, Loughborough Park, Brixton. Improvements in the construction of shafts and other

thereof.

1034 G. T. Bousfield, Loughborough Park, Brixton. Improvements in the construction of shafts and other parts of carriages.

1035 F. F. Villepigue, Northumberland-street, St. Martin's-in-the-Fields. Piercing or boring holes in rock, mineral, or other material of a similar nature, applicable in tunnel, mine, quarry, and other such work.

1036 A. Helwig, Old Kent-road, Keut. An improved stitching and button-hole sewing machine.

1037 J. M. Johnson, Northwick-terrace, Maids Hill, Middlesex. Improvements in lavatories, laundry washing troughs, washing stands, baths, cattle troughs, and other apparatus for holding fluids, or vessels or receptacles containing fluids, and also in apparatus for supplying and intercepting or controlling the flow of fluids to the same and to other receptacles or articles.

1038 E. O'Brien, Liverpool. An improved self-seeding discharging, and registering beam balance for weighing grain and other substances.

1039 R. B. Hooper and T. and H. B. Nickson, Liverpool. Improvements in the method of fastening and applying wood sheathing to the bottoms and sides of iron and other ships or navigable vessels, for the purpose of staching copper, yellow metal, zinc, or other sheathing thereto, parts of which improvements consist in a particular form of rivet or bolt connected therewith.



1040 A. V. Newton, Chancery-lane. An improved construction of baking oven.
1041 A. K. B. Granville, Sandford-on-Thames. Improvements in beating engines for preparing materials for the manufacture of paper.

Dated April 7, 1869.

1042 W. Goodreds, Tipton, Staffordshire. Certain improvements in the construction of furnace doors for puddling furnaces.

1043 J. Mason, Birmingham. Certain improvements in brook leading gone.

1043 J. Mason, Birmingham. Certain improvements in breech-loading guns.
1044 W. T. Rickard, Crown-court, Threadneedle-street, City. Improvements in the preparation of cements, 1045 R. Norfolk, Beverley, Yorkshire. An improved mode of, and apparatus for, casting screw threads on the naves of wheels and other articles.
1046 G. S. Chase, Belfast. Improvements in apparatus for the combustion of gas.
1047 E. Collard, Southampton-row, Bloomsbury. An improvement in ladies' bustles (or dress improvers).
1048 W. E. Gedge, Wellington-street, Strand. A novel system of self-acting ventilating apparatus, applicable sales to other purposes, and termed aerospires.
1049 H. B. Barlow, Manchester. Improvements in the construction of expanding caskets for jewels and other articles.

articles.

1050 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in the permanent way of railways.

1051 J. and J. Menzies, Perthshire. Improvements in

shuttles.

1052 J. H. Teale, Russell-place, Woodhouse-lane, Leeds. A new or improved apparatus to be employed in putting on or taking off boots or shoes.

1053 B. M'Evoy, Hall-street, Birmingham. An improved game suitable for outdoor and indoor exercise, and instruments and appliances connected therewith.

1054 J. Robins and J. Allbut, Tipton, Staffordshire. Improvements in pumps for raising and forcing liquids.

1055 W. Powell, Birmingham. Improvements in breechleading fragrams.

loading firearms. 1056 W. H. Douglas, High-street, Stourbridge. Im-

vements in glove fasteners.

057 W.H. Douglas, High-street, Stourbridge. An proved sleeve link or solltaire.

058 G. Ashcroft, Alexandria, Egppt. Improvements bardenilla Dresses.

1058 G. Ashcroft, Alexandria, Egppt. Improvements in hydraulic presses.

1059 W. H. Balmain, St. Helen's Lancashire. Improvements in the preparation of certain oxidizing agents, and the use of such agents for the preparation of chlorine for bleaching, for yielding oxygen, and for other useful pur-

poses. 1060 L. Mond, Farnworth-within-Widnes, Lancashire. Improvements in utilizing products arising from soda and

otash waste. 1061 W. E. Newton, Chancery-lane. Improvements in

steam generators.

1062 W. T. Eley, Gray's Inn-road, Middlesex. Improvements in the construction of cartridge cases for breech-loading firearms.

1063 C. E. H. C. Healey, Strand. Cleaning breech-loading firearms.

Dated April 8, 1869.

1064 J. W. Warman, Mariboro-street, Farringdon, Berks. A reduction of the distances apart of the levels of the manuals of an organ, so that the distance from one manual to that next it need not be more than two inches. 1065 J. I. Stassen, Euston-road, Middlesex. Improvements in the construction of velocipedes.

1066 A. H. Brandon, Rue Gaillon, Paris. An improved composition for joining leather and rendering it impermeable, more particularly in its application to driving beits, and in certain improvements in the pulleys for such belts.

1067 H. Parslow, Glasgow. An improved appliance to e used in designing the forms of certain parts of articles

be used in designing the forms of certain parts of articles of apparel.

1088 A. Stewart and J. Wotherspoon, Coatbridge, Lanarkshire. Improvements in machinery for cutting metal tubes, pipes, cylinders, bars, or similar articles, and for facing the ends or fianges thereof.

1069 R. W. Munro, Clerkenwell-green, Middlesex. Improvements in markers for whist and other games.

1070 J. Pattison, Newcastle-on-Tyne. Improvements in utilizing the ammoniacal skimmings obtained in galvanizing iron.

ing iron.
1071 D. and G. Hallas, Leeds. Improved apparatus for

1071 D. and G. Hallas, Leeds. Improved apparatus for regulating the supply and for purifying gas. 1072 J. A. Chaulourier, Paris. A new or improved continuous self-feeding cotton gin. 1073 A. Fryer, Manchester. Improvements in the employment of apparatus used in the production of sugar from sugar cane or beet root, and in the construction of parts of the apparatus connected therewith. 1074 W. T. C. Pratt, Newport, Monmouthshire. Improved apparatus for signalling on railways.

Dated April 9, 1869.

1075 G. D. Hughes and A. H. Sellers, Nottingham.
Improvements in self-acting safety valves for steam

1076 J. Aspinall, Harrow, Middlesex. Improvements in

1076 J. Aspinall, Harrow, Middlesex. Improvements in the construction and protection of telegraphic cables, and in machinery for the manipulation of the same, part of the invention being applicable also to the preservation of vegetable substances from marine minerals.

1077 W. A. Hunter, Southport, Lancashire. Improvements in apparatus for lighting street and other lamps. 1078 T. Culpin, Reading, Berks. Improvements in resping and mowing machines.

1079 J. A. Miller, Southampton-buildings, Chancerylane. Improvements in the construction of steam bollers, and in means for removing sediment and impurities therefrom, and in the method of introducing feed water thereto, part of such improvements being applicable to surface condensers.

surface condensers.

1080 J. Denis, Rue St. Louis en l'Ile, Paris. An improved machine for cutting, dividing, and turning straight and conical cogs of wood or of metal without displacing the coursel.

and conical cogs of wood of or mosal without any method the cogwheel.

1081 R. J. Morison, Mark-lane, City. Improvements in pressers for compressing and packing cotton, wool, hay, hides, and other fibrous and plastic substances.

1082 R. J. Colls and A. E. Bull, Reading, Berks. Improvements in fastenings for boots, shoes, and other asticles.

articles.

1083 J. Dewar, Kirkcaldy, Fifeshire. Improvements in treating certain substances for food and for manure.

1084 C.J.F. Campbell, Camberwell, Surrey. Improve-

ments in the means for hanging pictures, looking-glasses,

and other like articles.

1085 C. Lungley, Greenwich, Kent. Improved means of, and apparatus for, removing deposit from tubes, flues, of.

of, and apparatus for, removing deposis and passages.

1086 W. W. Hooper, Bow, Middlesex, and J. D. Hooper, Woodford, Essex. Improvements in the construction of vehicles, and in the means of propelling the same.

1087 W. E. Newton, Chancery-lane. An improved means of, and apparatus for, obtaining motive power for driving various kinds of light machinery.

1088 A. V. Newton, Chancery-lane. Improvements in rotary engines, pumps, and meters.

1089 T. H. Blamires, Huddersfield. Machinery or apparatus for receiving and registering, or indicating, votes at elections.

elections.

1090 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in paper, woven fabrics, and other porous substances, and in the treatment thereof, whereby the same are rendered waterproof.

1091 P. Jensen, Chiswell-street, Finsbury-square, City. Improvements in centrifugal and other pumps, and in syphons.

Dated April 10, 1869.

1092 H. W. Lobb, Sackville-street, Piccadilly. An

Dated April 10, 1889.

1092 H. W. Lobb, Sackville-street, Piccadilly. An improved velocipede.

1093 S. F. V. Choate, Boston, Suffolk, Massachusetts, U.S.A. Certain improvements in firearms.

1094 E. Brasier, New Cross, Surrey, and J. E. Hodgkin, West Derby. Improvements in machinery for scutching or cleaning flax or other vegetable fibres.

1095 W. Smith, Heywood, Lancashire. Certain improvements in looms for weaving.

1096 H. A. Bonneville, Sackville-street, Piccadilly. Certain improvements in sewing machines and their shuttles, and in attachments to sewing machines for sewing different seams and fancy stitches.

1097 W. Ashton and J. H. Storey, Manchester. Improvements in apparatus for ascertaining and indicating the duty of steam engines, modifications of the said apparatus being also applicable to other purposes.

1098 J. Hynam, Deptford, Kent. Improvements in apparatus for the manufacture of crucibles and jother hollow articles from plastic materials.

1099 J. M. Hetherington, Manchester. Improvements in machinery for combing cotton.

1100 J. B. Spence, Manchester. Improvements in the treatment of cast iron for its conversion into malleable iron or steel.

on or steel.

1101 P. Headridge, Lime-grove, Manchester. Improve-ents in dentistry for expanding the upper and lower ments in dentistry for expanding the upper and lower maxillary. 1102 D. B. Peebles, Edinburgh. Improvements in gas

meters.

1103 E. C. C. Stanford, Glasgow. Improvements in applying, treating, and utilizing materials for deodorizing solid, liquid, and gaseous matters.

1104 G. Haworth, H. Haughton, and R. Gibbons, Blackburn. Improved apparatus for facilitating the consumption of smoke.

1105 O. Vivier, Sekforde-street, Clerkenwell, Middlesex. Improvements in escapements for watches and other time-nices.

Improvements in escapements for watches and other timepieces. 1106 J. H. Johnson, Lincoln's Inn-fields. Improvements
in apparatus for removing hair from skins.
1107 J. Parry and R. Morris, Cambrian Slate Works,
Llanberis, Carnarvonshire. Improvements in saws for
cutting slate, stone, iron, or other metal or materials.
1108 E. T. Hughes, Chancery-lane. An improved
dtitch for sewing or stitching together straw, braid, or
similar articles, and machinery for making the same.
1109 W. Martin, Manchester. Improvements, in the
construction of ships and vessels.
1110 L. J. Crossley and R. Hanson, Halifax. Improvements in valves for regulating the discharge of steam,
air, or other elastic fluids.
1111 J. Wadsworth, Bromley-street, Manchester. Improvements in lighting fires and economizing fuel, and in
apparatus therefor.
1112 D. Johnson, Wrexham, Denbighshire. An improved mode of, and machinery for, manufacturing flour,
1113 J. H. Dales and J. F. Maygrove, Wood-street, City.
Improvements in the mode of, and in looms for, weaving
hair cloth and other fabrics.
1114 A. M. Clark, Chancery-lane. Improvements in
fountain pens.

fountain pens.

#### LIST OF SEALED PATENTS. Sealed April 9, 186

Beated Ap	111 0, 1000.
3118 F. W. Hart	3188 J. Cockshoot and H
3119 N. Smith	Weatherill
3124 S. Leoni	3196 W. Fitch
3125 A. Field and A. W.	3199 J. Elce
Tuer	3203 G. Chapman
3126 W. Brailsford and J.	3280 A. M. Clark
Gadsby	3304 J. G. Tongue
3128 T. F. Cashin	3309 W. H. Liddell
3130 H. C. Clifton	3326 A. M. Clark
3133 W. T. Sugg	3401 W. R. Lake
3134 R. Dawson	3422 R. Halliday
3136 J. Worster	3536 W. R. Lake
3140 J. Shanks	3650 A. Ransome
3147 E. Leach	3811 C. E. Brooman
3153 C. G. Gumpel	3981 F. A.K. W. V. Opper
3155 H. A. Bonneville	370 W. R. Lake
3159 E. Peyton	386 W. R. Lake
3159 E. Peyton	386 W.E. Lake

Sealed Apr	ril 13, 1869.
3145 J. G. Jones	3248 L Baggs
3152 J. Denley	3251 B. Hunt
3160 T. Gray	3286 J. B. O'Hea and V
3162 R. M. Wood	Bullen
3164 W. R. Lake	3363 A. L. Bricknell
3170 R. Head	3377 M. A. F. Mennons
3173 C. Churchill	3379 W. Broughton
3175 A. Denayrouze	3472 J. H. Johnson
3177 E. T. Hughes	3574 H. E. Newton
3178 C. Mayer	175 W. R. Lake
3179 D. Wilson	235 H. W. and R. La
3184 F. P. Warren	ferty
3185 R. A. Green	402 B. F. Sturtevant
3200 J. A. Farrar and B.	403 J. H. Johnson
R. Huntley	456 A. Morton
3210 J. F. Brinjes	531 M. Gray
3243 J. Gregson and W.	556 R. P. Williams
Monk	639 J. Howe

### NOTICES OF INTENTION TO PROCEED WITH

From the "London Ga	zette," April 13, 1869.
3647 J. W. Reid	3843 G. H. Benson and W
3652 H. A. Bonneville	G. Valentin
3667 J. Alexander and J.	3854 W. F. Thomas
Hill	3858 J. Edridge and J
3668 H. N. Maynard	Merrett
3669 S. C. Lister	3917 B. W. Maughan
3672 P. Hooker	3941 G. T. Bousfield
3676 L. J. Marechal	3955 I. Pick
3677 H. W. Grylls	3984 D. Spill
3682 C. H. Chadburn	9 F. Perry
3684 H. Kinsey	9 F. Perry 46 J. Mansergh
3686 W. R. Lake	95 G. V. Osborn and A
3688 H. Robinson	Peerless
3689 S. Hirsch	128 A. Sehet
3691 J. H. Johnson	177 G. A. Crow
3995 H. L. D. Marsden	377 T. Harrison
3696 J. S. Capelle	422 J. A. F. Suter and T.
3697 F. Beech	G. Hinde
3700 E. Francillon	537 R. Foster
3703 D. Thomson	597 J. A. F. Suter and T.
3704 R. Girdwood	C. Hinde
3706 E. K. Dutten	749 J. Bathgate
3710 J. Holmes	678 H. J. Cenant
3711 B. Fowler, D. Greig,	821 T. Martin
and R. Burton	823 J. C. Ramsden
3712 D. H. Paterson	843 A. V. Newton
3714 A. M. Clark	847 J. Hamilton and R.
3724 C. F. C. Cretin and	Paterson
J. Watson	856 H. E. Newton
3727 C. Farrar	861 J. Loader
3734 R. B. Roden	877 R. Gregson
3737 T. Lancaster 3738 F. W. and G. Moss	896 W. E. Newton
	904 W. R. Lake
3746 S. S. Anderson	915 W. R. Lake
3749 R. Needham	920 A. C. Kirk
3753 A. G. Goodes	934 J. W. Girdlestone
3758 A. Matthiessen	940 W. R. Lake
3763 C. E. Brooman	941 W. R. Lake
3770 P. Kotzo	946 G. T. Bousfield
3790 R. Norfolk	966 T. Greenwood and J.
3808 W. Bywater	Keats 1004 S. K. Hoxsie
3815 P. Kotzo	
3821 W. N. Nicholson	1017 F. Boyd
3832 S. C. Dister	to in the shows list on he
certained by referring back	ts in the above list can be to their numbers in the list

The full titles of the pack to their numbers in the list of provisional protections previously published.
Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the chiestion to the application. of the objection to the application.

## PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID;

641 J. Tansley 1019 R. Leake, W. Shields, and J. Beckett 1031 G. A. Ermen 1041 J. J. Bodmer

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID,

974 J. Colling 1028 G. D. Mertens 1032 J. Petrie

1224 G. T. Bousfield 1218 A. C. Kirk

## OF SPECIFICATIONS PUBLISHED

	For the week chaing April 10, 1005.										
No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
_	s. d.		s. d.	-	s. d.		s. d		8. d.	-	s. d.
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2579	1 6	2707	0 4	2718	1 4	2730	0 4	2742	0 4	2755	1 0
2645	1 6	2708	0 8	2719	0 4	2731	0 4	2743	0 8	2756	0 4
2663		2709		2720		2733		2744		2757	
2690		2710		2722		2734	-	2745		2758	
2696		2711		2723		2735		2746		2759	
2698		<b>271</b> 2		2724		2736		2747		2768	
2699		2713	10 -0	2725		2737		2748		2769	
2700		2714		2726	-	2738		2750			0 10
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PROVISIONAL PROTECTION FOR SIX MONTHS
Has been granted upon Specifications bearing the following numbers:—

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3840	843	887	907	924	939	957	973	
635	847	888	908	925	942	958	974	
787	853	889	909	926	943	959	975	
811	855	890	910	927	944	960	976	
821	857	892	911	928	945	962	977	
823	859	895	912	929	946	963	978	
825	861	896	913	930	948	964	981	
829	865	897	914	931	950	965	984	
831	867	898	916	932	951	966	986	
833	873	999	917	933	952	967	988	
835	875	900	918	934	953	968	990	
837	877	901	920	936	954	969	992	
839	879	905	922	937	956	972	994	
841	881	906	923	938				

Notice.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post office MoneyOrder should be sent, payable to ROBERTSON, BROOMAN, and Co., Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.



THE

### MECHANICS' MAGAZINE.

LONDON: FRIDAY, APRIL 23, 1869.

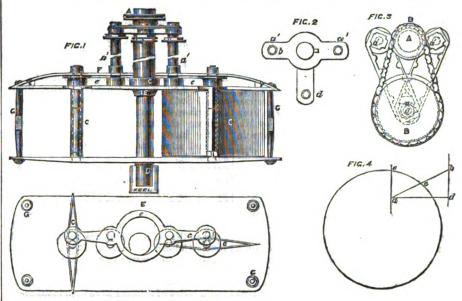
#### DR. LIVINGSTONE.

AST Christmas the scientific world indulged in the fond hope that the veteran explorer, Dr. Livingstone, would then be once more among them. Nor was this hope confined to men of science only. Such is the respect the name of Livingstone universally inspires, that the hope was shared in by all classes of the community, who have come to feel an almost personal interest in the welfare of one who has endured so much in the cause of science. The hope, however, proved delusive, and nearly four months have passed since the time of the great traveller's expected We still, however, lived in constant hope of news, and, only a few days since, everyone read with pleasure the announcement that Dr. Livingstone was at Zanzibar on last New Year's Day, and had left for England viâ the Red Sea and Alexandria. But the pleasure was short-lived; the renewed hopes were speedily dispelled by Sir Roderick Murchison, who received information which entirely contradicted the announcement in question. Sir Roderick has had a letter from Dr. Kirk, at Zanzibar, dated March 5 last, and at that time no news whatever respecting the great traveller had been received for a long period. Judging from his own letters of December 14, 1867, and also from the intelligence derived from Arab traders, it was believed last year that he was proceeding along the eastern shore of the Lake Tan-ganyika, and that, at the place called Ujiji, he would meet with provisions, medicine, and letters, which were sent thither from Zanzibar. But this view can no longer be entertained, for Dr. Kirk states that ivory traders have recently arrived from the very region in question, and had heard nothing of him.

In this dilemma, Sir Roderick Murchison suggests the following hypothetical explanation :- If Livingstone, when at the southern end of the Lake Tanganyika, satisfied himself that its waters were about 1,800ft. above the sea, as stated by Burton and Speke, he would necessarily infer that they could not flow northwards into the much higher equatorial lakes. In this case, he would abandon the northern route in which it was supposed he might find the waters of the Tanganyika flowing into the Albert Nyanza of Baker. Having also ascertained that the Tanganyika was fed by rivers flowing from the south and the east, it would be evident, under these circumstances, that this vast body of fresh water (300 miles in length) must find its way to the west, and he would then follow the river or rivers which issue on the west coast of Africa. Under this supposition, he may be first heard of from one of the Western Portuguese settlements, or even from those

If this view be entertained, we cannot expect to hear of Livingstone for some time to come, as the distance he would have to traverse is vast, and the region unknown. This hypothesis explains why no intelligence whatever respecting him has been received at Zanzibar, inasmuch as he has been travelling through a vast country, the inhabitants of which have no communication with the eastern coast. Whilst, however, correcting the erroneous intelligence, Sir Roderick states that he still entertains a well-founded hope that the distinguished traveller—thanks to his iron frame and undying energy—will issue from Africa on the same shore at which, after a very long absence, he reappeared after his first great traverse of Southern Africa. We trust these hopes may find a speedy realization,

MOODIE'S HORIZONTAL PROPELLER.



#### HORIZONTAL PROPULSION.

LTHOUGH the principle of horizontal A. propulsion possesses several natural advantages which are not common to vertical propulsion, it has not hitherto received that attention which might have been expected in an age when there are so many departures from ordinary rules and systems. Some attempts, we believe, have been made in America to utilize the principle of horizontal propulsion, but with what success we cannot say. At home, Mr. William Moodie has given the subject his careful attention, and has recently laid the result of his experiments and investigations before the Institute of Scottish Engineers. The advantages of horizontal propulsion are, that in smooth water the immersion of the propeller is perfectly uniform, and in rough weather, owing to the proximity of the propeller to the keel, the effect of shocks from the crests of the waves is lessened. Hence, the strains on the gearing rods and the wear of the working parts must be comparatively slight. Should any difference of strain exist on one side more than on the other of the float axles, it will probably be due to a gradual or glid-ing motion of the centre of gyration. The alternate immersion and emersion of the ordinary vertical feathering paddle-wheel causes the resistance, for the time, to be on one side of their axis, thereby producing greater strain on the gearing rods, and abrasion of the working joints, than in the case of the horizontal propeller.

In Mr. Moodie's propeller—of which we annex an illustration—the float motion is produced by spur gear, although, of course, other forms of gearing, such as chain, eccentric or course, tric, or crank rod, could be applied above or below water line to give the requisite motion. This motion is half a revolution of the floats on their axes, for a whole revolution of the propeller. In fig. 1, A is the main shaft of the propeller, carrying a T-shaped bracket, C C are the floats, D the shaft pivot, E the upper arm, F the cover of the gearing case, and G G are cross stays. The arm b, fig. 2, supports the upper ends of the shafts a 1 a 1, on the lower ends of which are cranks, communicating the proper motion to the floats through their connecting rod cc. The floats, being furnished with corresponding cranks, turn their centres perfectly. This motion is

spindle d (fig. 2) are keyed two square pulleys, giving the motion stated. Cranks, however, would perform the same office, and would, we think, be preferable.

We have illustrated the system by a two-

float propeller, and this, in fact, is the form with which Mr. Moodie has experimented, but a propeller of three or more floats could be actuated by the float motion being carried down by a hollow shaft surrounding the main shaft. In sailing alternately with power, the propeller could be uncoupled by a catch box; and even with two floats, would run round easily if the gearing be kept in action, as when propelling, but not otherwise. Two floats, if turned by a hollow shaft, must have a loose crank—out of the line of centres-to their connecting rod to turn them over their centres. The floats are shown with hollow centres, their cranks fitted fast, but the under portion—about two-thirds—revolves on a pivot, which is fast in the bottom plate of the propeller: this arrangement is to give great bearing surface. The correct angle for the floats is 90deg., i.e., any float passing a given fixed point will be at right angles when diametrically opposite.

The theory of this propeller is propounded by Mr. Moodie in the following terms, reference being had to fig. 4 of the engraving :-The column of water acted on by a float a b, is measured in depth by the depth of the float, and in width by the perpendicular distance between  $e\ a$  and  $b\ d$ , viz., by  $a\ d$ . But L a b d is the angle of the float to keelline, and  $a d = a b \times \text{sine } \angle a b d$ . Therefore, the column of water moved by a float is measured by the length of float  $\times$  depth  $\times$ sine  $\angle abd = area(A) \times sine \angle abd$ . Now, with two opposite floats, when the angle abd of one = 0deg., that of the other = 90deg., or one = odeg., that of the other = 90deg., the acting power of the propeller then is equal to A (sine odeg. + sine 90deg.) = A minimum power: and when the angle of one float = 45deg., that of the other = 135deg., therefore, the power = A (sine 45deg. + sine 135deg.) = A  $\sqrt{2}$  (maximum power). In a similar manner, it can be shown, that for a propeller with three floats, at equal distances, the power varies from A  $\sqrt{3}$  to 2 A. And so on, for any number of floats. Since the central pinion on the hollow shaft is only half the diameter of the wheels on the float axles, and prevented from revolving with got by a pitch-chain embracing the wheels
B (fig. 3), the respective diameters of
which, being as two to one—the smaller
one capable of being turned round freely,
and so manœuvring the vessel, by changing
the floats to any desired position or angle to
the keel-line. On the lower end of the

circle either way-or be brought to a stop while the engines go on in one direction. When under canvas only, the floats will act like balanced rudders—when the propeller is working, the steering power is so great that, although the rudder were set to steer straight ahead, the vessel could be canted with no perceptible resistance from the rudder; and as the floats are balanced, there is very little resistance on the steering wheel.

The practical side of the question is represented by some experiments which have been made with the horizontal propeller by Mr. Moodle. They show a large percentage in its favour over the ordinary propeller. They its favour over the ordinary propeller. They were made with a boat of the following dimensions:—Extreme length, 16ft. 5½in.; beam over all, 3ft. 9½in.; draught forward, 1ft. 5in.; draught aft, 1ft. 10in. The dimensions of engine were:—Diameter of cylinder, 3in.; length of stroke, 6in.; boiler pressure, 45lb. The safety valve was blowing off slightly during all the runs. The horizontal propeller had an effective diameter of 10in. The number of revolutions per minute was 140, the distance tried over was 758ft., and average time per run was 2min.; or, at the rate of 4.30 miles per hour. The screw propeller against which it was tried had a pitch of 2ft., the number of revolutions per minute was from 149 to 150, the distance tried over was 758ft. (as with the horizontal propeller), and the average time per run was 2min. 42sec... or at the rate of 3.19 miles per hour. This result shows a clear percentage of gain in favour of the horizontal propeller of 35. The screw was of the most approved form for speed as applied to small craft. The result of these trials unquestionably shows a great advantage in Mr. Moodie's ingenious apparatus over the screw, and should lead to further experiments in the same direction on a larger scale. The only objections that at present appear in view are the wheelwork, and the number of parts in the apparatus. These, however, are points which may be surmounted by practical men in working out the idea. To overcome these difficulties will be to inaugurate a new method of propulsion, for the introduction of which, so far, great credit is due to Mr. Moodie, whose principle we hope to see further developed and applied.

### INDIAN TELEGRAPHS.

"OUR experience of its operations has led us to the conclusion that, for com-Us to the conclusion that, for commercial purposes, it is not of the least use as at present conducted." "Our experience leads us to place little or no confidence in the telegraph office as a means of transmitting messages." These extracts are taken haphazard from a number of opinions expressed by the merchants of Calcutta in 1861 relative the then state of telegraphy in India. They are given as the expression of opinion at that time of Indian telegraphy, which was then held up to ridicule, no confidence being held either in its speed or accuracy, the ordinary postal system being preferred, which, though slow, was sure. With the extent of telegraph then existing, it is a sad picture to look back upon; but, as out of evil comes good, so, out of the wretched system of telegraphy that was then a bye-word, by dint of skilful management and administrative talents, good has come, and the system in India now holds up its head, and may fairly be ranked as standing high in the order of telegraphy. The great changes that have led to this satisfactory result are due principally to the farseeing vision of the late viceroy, Sir John Lawrence. The inherent defects of the sys-Lawrence. The inherent defects of the system appear to have been early grasped by him, and measures taken to improve and extend the system; the result is apparent, and the improvement of telegraphy in India

braced a length of line of 11,350 miles, and a length of wire of 11,661 miles, there being but a slight difference between the two. At the expiration of his viceregal term, 1868, the system consisted of—Length of line, 13,855 miles; length of wire, 22,567 miles. Instead of being nearly similar, the mileage of wire had increased to nearly 2 to 1, the increase during the five years being-Length of line, 2,505 miles; length of wire, 10,906 miles. Such a result cannot but be considered as eminently satisfactory. However, the increase of mileage would be valueless if the increase and improvement of the internal administration had not also been advancing. For, as matters were at that date, an increase in mileage would have had no benefit in restoring public confidence unless the management had largely improved. Such has unquestionably been the case, and the largest share of improvement has undoubtedly been shown during the time the present director-general has held office. In 1865, Colonel Robinson, R.E., from his known administrative talents, was appointed by Sir John Lawrence director-general. The appointment was given to the right person, and a series of reforms have been inaugurated that, when their full force has been felt, will raise the telegraphic system of India probably on a par with the best in the world. It is since Colonel Robinson's accession to office that we have been able to obtain really accurate details of Indian telegraphy, and, from returns compiled under his direction, we are enabled to glance at some of the improvements during Sir John Lawrence's governorship.

First, with regard to the through transmission and the Indo-European telegraph, with which we are most interested. In April, 1865, Colonel Douglas reported the errors on the Indo-European messages contracted in India as amounting to 38 per cent. This amount has been gradually and surely reduced; in 1867 the maximum was 8 per cent., and in 1868 only 4 per cent., this percentage undergoing a gradual reduction to below 2. For the corresponding period, Indian messages show a reduction from 21 per cent. to less than 1 per cent., a result which will compare favourably with that of any telegraph system. During each of these years there appears to be a slight increase of error in the monsoon season, which may be accounted for electrically, and not as the fault of the manipulators. We cannot give statistics of the percentage of errors formerly, but the fact that errors have been reduced as low as 1 per cent. effectually removes the stigma formerly cast upon Indian messages that they "are frequently so distorted and rendered unintelligible that they are not of the least use when received." "Messages are often late, sometimes missing, and rarely correct." That this improvement in accuracy has not been purchased at the expense of speed in transmission, but rather that improvement in speed as well as in accuracy, has been going on, we shall endea-

vour to prove.

We will take the monthly average time of transmission of messages between Bombay and Kurrachee, and Calcutta and Kurrachee, as our first instances:—

BOMBAY AND KURRACHEE.

Date.	Maximum.	Minimum.	Average.
1866.	67	5	17
1867.	21	2	7
1868.	17	1	5

#### CALCUTTA AND KURRACHEE.

Date.	Maximum.	Minimum.	Average.
1866.	51	7	27
1867.	36	8	20
1868.	26	6	11

same period of the year, during the monsoon season, and were it not for the peculiarities of the climate, the average time of transmission would contrast very favourably indeed with telegraphy elsewhere, especially when one considers the distance between the places. In talking of Bombay and Kurrachee, distance seems to have a diminishing effect, and people speak of them as they would of London and Edinburgh; but when we compare the relative mileage, 400 in the latter case, to 1,300 in the former, it will be acknowledged that taking the monsoon into consideration, an average of five hours (we speak in round numbers) during the year is a fair average, and, as compared with two years previously, shows a reduction of more than one-third of the time.

Special efforts have been made to improve the main Indian routes, in connection with European traffic; but that the rest of the Indian routes have also undergone improvement, the following figures will give ample evidence :-

CALCUTTA AND BOMBAY.

Date.	Maximum.	Minimum.	Average.
1866.	38	9	21
1867.	36	9 <del>1</del>	10
1868.	25	8	12

Space does not permit, or other instances of improvement might be shown. We have, however, shown that telegraphy in India has good reason now to be held in respect, where formerly it was held in ridicule. A reduction of errors in India, from 38 per cent. to below 2 per cent. on Indo-European messages, and to less than 1 per cent. on local messages, and an increase in the average speed of messages from seventeen and twenty-seven hours to five and eleven hours, show signs of wonderful progress, and gives results that can be favourably compared with other systems. But, with regard to errors, there is still room for improvement, and we doubt not that when our readers' attention is again called to the question, further improvement will be shown. Our Indian telegraph system is now worked on a good practical basis, and, as its success has been so incontestably proved, its continued success will be shown by still further improvements.

In this respect the term of office of the late Viceroy has been productive of great good, and those people, connected by commercial or other pursuits with India, must acknow-ledge the good that has been done; but, whilst giving credit to the able administration of Sir John Lawrence, we must not omit to give our unqualified praise to the present director-general, who has done so much in so short a time to cause so great an improve-ment. Though, as a rule, objecting to appointments requiring a special technical knowledge being given to one totally without experience or acquaintance of the nature of its duties, &c., yet, in this case, we sincerely believe that the appointment could not have been better made, even if one had been selected who possessed all the necessary

requirements.

During the time Colonel Robinson was in England he made himself thoroughly conversant with the advantages of the various telegraphic systems. The knowledge so obtained has enabled him to keep out of the old Indian groove, and bring Indian tele-graphy to its present highly efficient state; and we trust shortly to be able to report, that, in addition, he has brought it not only to a more prosperous but a remunerative condition.

### THE ROYAL INSTITUTION.

and the improvement of telegraphy in India is daily manifest.

When Sir John Lawrence took charge of India, the telegraph system then (1863) em
The time is given in hours. The time of maximum transmission occurs always at the Temperatures and Animal Life of the Deep



Sir Henry Holland, Bart., F.R.S., d. The lecturer said that until very recently philosophers were strongly of opinion that there could be no animal life in the deep sea, because of the enormous pressure of the water; moreover, as some of the earlier dredgings proved that animal life decreased the greater the depth of the water, a kind of rule-of-three sum was made to show that at very great depths animal life would probably be absent. About fifty years ago, General Sabine saw a starfish brought up from a depth of 1,000 fathoms, in Baffin's Bay, and the fish had some of the green mud of the bottom sticking to it; likewise, in surveying the proposed North Atlantic cable route, via Greenland, a few years ago, H.M.S. "Bulldog" brought up a live starfish from a depth of 1,260 fathoms. It was, however, disputed in scientific circles, whether these fish really came from the bottom or from mid-water. Dr. Carpenter all along was inclined to think that they came from the bottom, because he had studied the habits of starfish in an aquarium, and noticed that they always crawled along the bed of the tank , and never swam. Facts about life in the deep sea have been collected within the past few years by English and American ships, employed by their respective govern-ments to make soundings along all the proposed Atlantic cable routes, from the Azores in the south as far as Greenland in the north. Sir James Ross once made dredgings in Antarctic regions, but, unfortunately, the results were never published Last summer, the Admiralty sent out a ship to make soundings to the north and north-west of the Hebrides, and Dr. Carpenter accompanied the expedi-tion. The result of all these researches is to demonstrate that life is present in the deep sea, that soft fleshy animals can exist where the pressure of the water is 300lb. to the square inch, and that on the bed of the Atlantic Ocean there are now many animals living which geologists and naturalists supposed to be extinct.

The bottom of the North Atlantic Ocean consists, for the most part, of soft white mud, which will be known to the geologist of the future as "chalk." This mud contains many soft sarcodic animals, known as foraminifera and globigerina; they are covered with delicate white shells, and, for the most part, can only be examined under the microscope. In many instances, they have been brought up alive. Sponges also are plentiful on the deep sea bed, but they are remarkable for the siliceous composition of their skeleton framework, and, in fact, belong to a class long supposed to be extinct. As the temperature of the deep sea bed varies considerably, so do the kinds of animal life in different parts of the bed; where the water is warm, animals of the type found in the Gulf of Mexico predominate. Thus, not only is a true chalk formation going on at the bottom of the Atlantic, but in different parts it contains different animals. Sir Roderick Murchison had told the lecturer that till these facts were brought under his notice he should certainly have said that such formations could not have been contemporaneous, had he chanced to meet with similar rocks in his geological studies. When dredging very far geological studies. When droughed north in the Atlantic, the white mud is not always brought up, but sometimes volcanic stones in its stead. It seems as if the Gulf stones in its stead. It seems as if the Gulf Stream spreads out into fingers towards the north, where it meets with cold currents coming back. The motions of these great bodies of water are, however, so slow that they hardly deserve the name of "currents."

As regards the temperature of the water, it was always very nearly 52deg. at the surface, no matter where the expedition of last

minimum thermometer will not go down quite low enough, as all who are experienced in the use of such instruments can testify, and it may be that the pressure of the water upon the bulb at great depths may tend to make the indications rather too high. At all events, in the following tables of results, if the figures err at all, they err in being too high rather than too low:

DEPTHS AND TEMPERATURES OF SOUNDINGS. WARM AREA.

Number of Sounding.	Depth in Fathoms.	Temperature.	
		At Surface.	At Bottom
1		deg. min.	deg. min.
_	500	54.5	49
2	164	54	48.5
3	229	54	48
4	72	54	49
5	62	53	50
12	530	52.5	47.3
13	189	52	49
14	650	53	46
15	570	52	47
16	650		_
17	620	52	46

COLD AREA.			
6	510	52	33
7	500	51	32.2
8	550	53	32
9	170	52	41.7
10	500	51	33
11	450	50	33.2

Sounding No. 9 in the above table was on the top of a bank, which accounts for the difference in the results.

### THE INSTITUTION OF NAVAL ARCHITECTS.

NO papers were read on the important subject of the sheathing of iron vessels, the first by Mr. Grantham on copper sheathing, and the second by Mr. Benjamin Bell on zinc sheathing. One of the chief difficulties the naval architect has to contend with is the sea weed and barnacles, which attach themselves to the sides and bottom of the ship. The builder may lay down the finest lines, and may put the maximum engine power into his vessel; he does his best, and the ship will do well at the measured mile, if the trial is made immediately the vessel is undocked. The speed attained on the trial trip, however, is no criterion of what can be got out of the vessel, when she has been at sea a few months or even weeks. In the official report of the Controller of the Navy on the comparative trial between the "Bellerophon" and the "Minotaur," the fact that the former had been out of dock twenty-one days, while the latter had been undocked only nine days, is particularly referred to as an unfair advantage the one ship had over the other. Mr. Grantham tells us that sometimes a vessel loses as much as half her power from fouling. This fouling has been attempted to be remedied in several ways. Prevention is better than cure, is a well-known proverb; but all attempts to prevent the weed and barnacles from attaching themselves to the ship's bottom, have, so far, signally failed, and it is now universally allowed that the only way to keep the bottom in any degree clean, is to employ some substance which will, day by day, peel off in indefinitely thin layers, and will so allow the ship to change its skin, and

is very dear, for one thing; and, what perhaps is still worse, the copper skin must be kept perfectly sound and watertight. If once the salt water finds it way in through any flaws in the copper, galvanic action sets in. The copper remains clean, and is saved from wasting, but unfortunately at the expense of the iron skin and bolts. The economy is that of the Irishman's, who catches cold by walking with bare feet to save his shoes. walking with bare feet to save his shoes.

Mr. Grantham's paper had reference only to copper as a means of protecting iron ships.

It described a method of coppering vessels, which in its essential points has been used both in the mercantile service and also in the page. It consists of feetening always of It consists of fastening a layer of the navy. wood planking to the iron skin, then another layer of wood to the first, and then over all layer of wood to the first, and then over all the sheet copper to the outer layer of wood. All this is necessary to insulate the copper and the iron. This is a very expensive process, and one which cannot be successful. The straining of the vessel at sea, or its grounding, will soon impair the continuity of the copper and this copy days. the copper, and this once done, the copper is little or no good. We will, therefore, leave the subject of copper sheathing, and pass to Mr. Bell's paper on zinc as a means of protecting iron ships. This metal has, as is well known, with refer-

ence to iron in salt water, exactly the opposite property to that which copper has when immersed in salt water in conjunction with iron. The copper is electro-negative with respect to iron, that is to say, no action takes place on the surface of the copper, but the whole action is on the surface of the iron, which is corroded by the chemical action which is set up. On the other hand, zinc is electro-positive with regard to iron. The zinc is attacked by the chemical action and is wasted away, while the iron is preserved intact. This property of zinc shows us its value as a sheathing for iron ships. It may be fastened on to the iron skin in any of the methods now in use for copper sheathing, with this in its favour,—the zinc sheathing need not be watertight like the copper must; in fact, it ought not to be so. The salt water getting in between the iron skin and the zinc is the cause of the galvanic action, which preserves the iron at the expense of the zinc. The zinc exfoliates, carrying away the weed and barnacles. The intensity of this action can be regulated by the proportion of zinc to iron that is exposed to the action of the water. Zinc has also been used in boilers as a means of protecting the boilers themselves from the action of the salt water, which has passed through the copper tubes of the condenser. The zinc has been found to waste at the rate of more than one inch in a month. Nobody can doubt that the use of zinc as a means of protecting iron vessels, of which Mr. Bell is than the use of copper. We cannot help thinking that zinc must very soon take the place of copper. We shall have to familiarize ourselves with the phrase "to familiarize ourselves with the phrase "to zinc" a ship, and we shall be allowed to forget the one we have been used to for so long "to copper." The zinc is much the cheaper metal, and if it had no other advantage, this alone would decide the race in favour of the zinc over the heavily handicapped copper. Mr. Bell's paper we have thought worthy of a verbatim reprint, and it will be found on another page of our present number.

Professor Rankine contributed a paper on the strains in propeller shafts. Like most of the papers of this gentleman, this one is very full of matter, and is almost incapable of being compressed. We will, therefore, merely mention a few of the points which are discussed in this paper. According to experisummer made the soundings. But at the bottom the temperatures were very different.

At each sounding three thermometers were used, and their indications commonly agreed pretty closely. Sometimes the index of a attended with very many disadvantages. It large taskin, and discussed in this paper. According to experiments, the best wrought-iron axles of very smoothly running railway carriages, at speeds notabove twelve miles an hour, will safely bear to a great extent. Its use, however, is a stress of 9,000lb. to the square inch. But

is sure to be found out in the long run, by a stress of this magnitude. If we take into account only the twisting action of the shaft, the maximum stress in actual vessels on the propeller shaft is found to approach very nearly the value given above. The real in-tensity of the stress is greater. Together with the twisting action, there is always a bending action, produced partly by the weight of the shaft, and partly by its reaction when the vessel pitches, i.e., partly statical and partly dynamical. This bending action should be dynamical. This bending action should be calculated, if we would know the actual limits of safety for the propeller shaft of any vessel. Professor Rankine gave formulæ for calculating these different actions, with numerical examples, and he also gave rules for designing the shaft of a given vessel. We would recommend everyone whose business it is to design large engines to consult this paper. It is important not only to marine engineers, but to the makers of all engines which have large and heavy shaftings. Its author tells us that "it seems probable that if the method of calculation now described were applied to actual examples of propeller shafts, many instances would be found in which the resultant stress reaches, or even goes beyond, the utmost limits consistent with safety."

The resistance of vessels was the subject to which Mr. John J. Thornycroft, C.E., devoted a short paper. The results of some of the most extreme forms of vessels were compared with those estimated by a new formula, which Mr. Thornycroft exhibited, and we must allow that there was a very remarkable coincidence in the velocity of different known vessels as actually obtained and as calculated from this new formula. However, as there are four constants in the formula, which must be obtained by trial, and as Mr. Thornycroft did not expressely tell us that these constants had been obtained from one set of ships, and then the formula applied to another set (namely, those whose calculated and actual performances he compared in a diagram), we cannot at present put any faith in the new

Staff-Commander Bourchier, R.N., read a paper describing a new design for a life buoy, of which he exhibited a working model. If a man overboard is lucky enough to reach a life buoy at present (it does not matter whether it be the annular life buoy of the merchant service, or the cross-shaped one in use in H.M. navy), he has to expend all his energy in holding on. If the water is cold, or the sea rough, this exertion soon becomes too much for exhausted nature, and the man drops off and is lost. This defect is supposed to be remedied in the proposed buoy, which is formed of an airtight double cylinder. This cylinder floats on the water, and carries a light metalwork basket, into which the man over-board, it is hoped, will be lucky enough to climb. Here he will stand with merely his legs in the water, till he is picked up. Of course there are other improvements proposed, such as flags to attract notice in the day time, and signal lights for the nights; but it seems to us, that the essential improvement in the proposed design, is the affording the man whose life is in danger something more than a mere floating mass to cling to.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

THE ARTIFICIAL PRODUCTION OF ALIZARIN-PRINT-ING ANILINE BLUE ON CLOTH-THE DETERMINA-TION OF SULPHUR IN CAST IRON-THE RECENT EXPLOSION IN PARIS-NEW MODE OF PROCURING

WE have received a little more information on the conversion of anthracene into alizarinalluded to in our last-but not very much. It seems that the discoverers, MM. Graebe and Liebermann, tried the action of powdered zine upon alizarin, and, thy its agency, removed the oxygen

from the alizarin, and reduced it to anthracene. It was natural, therefore, to conclude that, by the oxidation of anthracene, alizarin would be procured. As a fact, it is found much more easy to remove oxygen from a molecule than to get it in; but this, the chemists we have named, have succeeded in doing, no doubt in a roundabout way. for the attempt to oxidize organic bodies directly mostly leads to their complete destruction. Lauth suggests that the desired result may possibly be obtained by, first, converting the anthracene into sulphanthracenic acid, and decomposing this with soda. The resulting product, he says, ought to be either alizarin or something convertible into it by further exidation. Purpurine, the other essential colouring matter of madder, is also converted into anthracene by the reducing action of zinc, and so, it seems, are a number of other vegetable products. Alizarin from anthracene will probably remain a chemical curiosity for some time to come, but, in the end, the discovery may lead to as great changes in the trade in madder as the aniline colours have made in that of safflower, the importation of which has almost ceased.

While on the subject of colours, we may notice a French patent for the production of a solid aniline blue on cloth. What is called aniline black all calico printers know to be only a very deep violet blue, and the inventor who takes out this patent has imagined that by altering the proportions of the re-agents, he can moderate the action, and stop, at will, either at a light violet blue, a blue grey, or a grey. The proportions he gives for the production of the blue are as follows:—
In a litre of water he dissolves 100 grammes of aniline, 40 grammes of chlorate of potash, 3 or 4 grammes of sulphate of iron, 10 grammes of salammoniae, and 60 grammes of an aniline salt—the hydrochlorate or tartrate answering best. mixture, properly thickened, is printed on, and treated just as for the black. How the process succeeds we can hardly guess; but we fancy it will result in a colour, which, if not black, will have little permanence.

Gintl gives a very easy method of determining the impurities in cast iron. It is applied by him to the estimation of the sulphur contained in the iron, but, as will be seen, it is available for the separation and determination of most of the usual The iron is reduced to as minute a impurities. The iron is reduced to as minute a state of division as possible, and is then treated with a strong solution of perchloride of iron, as nearly neutral as possible. The mixture is kept heated for ten or twelve hours, at the end of which time almost all the iron will be found to have dissolved, leaving, as a residue, the carbon, sulphur, phosphorus, and silicium, togother with the little iron left undissolved. This residue has only to be well washed, oxidized, and dissolved, and the sulphur estimated as sulphate of baryta. The exact plan directed by the author is to intro-duce the residue and filter into a porcelain crucible, having, at the bottom, 3 parts of nitrate of potash and I part of bydrate of potash; heat to fusion, dissolve, and precipitate with chloride of barium. The phosphorus and silica will be contained in the same solution, and can be deter-

A report by M. Fontaine, in the "Bulletin de la A report by M. Fontaine, in one School at the mixture which exploded with such frightful results in the Place de Sorbonne, was a mixture of picrate of potash with chlorate. M. Fontaine states that he has been engaged since 1861, with the French War Department, in making experiments with picrates, chlorates, and nitrates, to find a substitute for powder, applicable for torpedoes, quick matches, and other things. He has found to his cost that he has succeeded in producing a most destruc tive compound, and nearly shared the fate of that often mentioned unfortunate—the engineer who M. Fontaine, was hoisted by his own petard. M. Fontaine, almost as unfortunate, suffered vicariously in the person of his son.

mined separately.

Oxygen procured cheaply and easily is, as we have often said, a very desirable thing. The numerous applications that could be made of it are so evident that we need not stop to mention them, but we lay before our readers yet another plan, and this time an ingenious one, for obtaining it. The mineral sources of oxygen being comparately exponsive, MM. Montmagnon and Delaire have betaken to themselves to that cheap reservoir our atmosphere, and have further availed themselves of the discri-

be understood, the figures of the authors we name, without checking them by a reference to the figures of Dr. Angus Smith, who has made most careful experiments on the absorptive action of charcoal. According, then, to our anthors, I(N) litres of fresh wood charcoal will, when exposed to atmospheric air, occlude 925 litres of oxygen, but only 705 litres of nitrogen. Now, it would appear tha when the charcoal so saturated with gas is thoroughly saturated with water, there will be expelled. 650 litres of nitrogen, but only 350 litres of oxygen. Thus we have now left in the pores of the charf coal 575 litres of oxygen, and only 45 litres of nitrogen, that is, oxygen practically pure for industrial purposes. To extract the gases, the authors employ a pump, and they tell us that it again exposed to charcoal, the oxygen will be obtained almost pure. There can be no doubt They give no account of the cost of oxygen; but it is clear that it will be represented chiefly by the cost of the machinery and cost of work-

#### PARLIAMENTARY NOTES.

YESTERDAY week, Mr. Baines, in the House of Commons, asked the Postmaster-General if he could inform the House whether the Telegraph Bill would be prosecuted, and, if so, whether he could state when

The Marquis of Hartington said that he could not add anything to the answer he gave on this subject two weeks ago. The fact was that the arbitrations under the Act of last year as to the sums to be received by the companies were in progress. Some of those arbitrations had been completed, but a large number was still in progress, but when they approached completion, and it was possible to form an estimate of the amounts to be paid, he should be able to state the intentions of the Government. It was intended to-morrow to move for leave to bring in a Bill to enable the Government, if they purchased the property of the telegraph companies, to obtain the monopoly for the transmission of telegraphic messages.

On the following evening, a question, which was asked last session, was again repeated, with regard to the wretched collection of timbers at Waterloo Bridge, and received the same reply. Mr. G. Gregory asked the President of the Board of Trade whether his attention had been called to the piling in the River Thames between the Charing Cross Railway and Westminster Bridges; and whether he could state when it would be removed, or who was responsible for the continuance of it.

Mr. Bright said that was a matter with which no Government department had at present any The piles to which the hon. power to deal. gentleman referred were connected with the works of the Waterloo and Whitehall Railway Company, and that company had time permitted it up to July, 1870, up to which time no person could legally interfere with the piles. After that date it would be in the power of the Board of Trade and the conservators of the Thames to take

steps for their removal.

Mr. J. B. Smith then put a question to Mr. Bright respecting the metric system, in reply to which Mr. Bright said that the state of the law with respect to the use of metric weights was not satisfactory, and nothing could be more absurd than that it was lawful for a man to use a certain description of weights and measures, but that he should be liable to a penalty if they were found in his house and shop. He was surprised that his hon. friend did not take care that the Bill was more carefully worded, in order that his object might be secured. As to the possibility of bringing in a bill during the present session to amend the law, he might tell his hon. friend, what he no doubt knew, that the Standard Commission had reported in favour of the change which he had so strongly, and for so long a time, advocated in the House, and he supposed that some time, when the Government or the Board of Trade had a great deal more leisure than at present, a measure upon the subject might be introduced; but he did not think that there was any probability that it would

Last Tuesday evening, Mr. W. Cowper asked the Secretary of State for War whether it was intended to alter the organization and position of mative action of wood charcoal and water, or the Military Train; and, if so, when the character certain saline solutions. We give here, it must of the intended alteration would be announced.



Mr. Cardwell, in reply, said that a change of that nature was now in course of progress under the Control Department. The warrant directing the constitution of the new corps was now under the consideration of the Commissioners of the Treasury, and as soon as it had received her Majesty's approval it would be made public.

At the same sitting, Mr. Stacpoole asked the Under Secretary of State for India if it was true that her Majesty's transport "Crocodile" lately left Malta for England nearly empty, while General Lysons and other officers and men whom she might have accommodated were waiting for pas-

sage home at the public expense.

Mr. G. Duff said it was within his knowledge that the "Crocodile" came home without any troops on board, but he knew nothing whatever of any application having been made on behalf of General Lysons, or any other officer, for a passage on board that vessel. If an application had been made in proper form, it would no doubt have been complied with. It had not hitherto been the practice to give passages on board her Majesty's vessels to officers and men not entitled to a passage at the public expense, but he thought that in such an exceptional case as the one to which the hon. gentleman had called his attention, that rule might have been departed from.

### LONG AND SHORT IRONCLADS. BY MR. E. J. REED, C.E.

(Concluded from page 275.)

THE last investigation in the paper is purely theoretical, and consists of a determination of the dimensions which would be required in two ships, of which the horizontal sections are curves of sines, and which are prismatic vertically, if they were built with the same weight per square foot of hull (say 1 ton) as the "Bellerophon," but carried twice the weight of armour per square foot (say 6-28ths of a ton). In these cases the bottom is taken to have weight as well as the sides, the speed for both is 14 knots, the draught of water is 25ft., and the depth of the armoured side 24ft. One of the ships is seven times her breadth in length, and the other is five times. Professor Rankine's rule for the calculation of horse power and speed is employed, and the same conditions of engines, &c., are assumed, as have which the horizontal sections are curves of sines. conditions of engines, &c., are assumed, as have been indicated previously. The larger ship carries 1,350 tons additional weight, and the smaller 900

The results obtained for these ships are as follows, when expressed in round numbers:-

	Larger ship.	Smaller ship.
Length	585ft.	425ft.
Breadth	84 ,,	85 ,,
Nominal horse power	1,267 H.P.	980 H.P.
Indicated	8,890 ,,	6,860 ,,
Weight of hull	7,586 tons	5,540 tons
n armour and }	6,124 ,,	4,470 ,,
engines and coals	2,540 ,,	1,960 ,,
" carried	1,350 ,,	900 ,,
Displacement	17,600 tons	12,870 tons

These results are very different in detail from those obtained in the cases based on the actual trials of the "Bellerophon" and "Minotaur," but not greater than might have been anticipated from the adoption of such a different form of ship, and mode of calculating resistance. The 2,000-horse power which is needed by the larger above the power required by the smaller ship, is principally due to the difference between the immersed surfaces of the two ships, and is spent in overcoming friction. The imships, and is spent in overcoming friction. The immersed midship sections, it will be remarked, only

mersed midship sections, it will be remarked, only differ by a very small amount.

This last investigation serves to show that the theoretical best form of ship being taken, and the most recent rule being applied in the calculations, the speed of 14 knots can be obtained in the short type of ship at a surprisingly less cost and size than the long type requires, and this result agrees with that of the preceding investigation based on actual trials.

I will now refer briefly to another aspect in the case of long versus short ironclads. Supposing two ships to be constructed, having the same central, bow, and stern batteries, and the same height of port above water, the same depth and thickness of armour in the water-line belts, the same proportion of weight of hull to total surface, and the same equipment and armament, with engines of the same type, and with weights of coal which would enable them to proceed equal distances at the same speed, would the advantage, on the whole, rest with the ship which had the form and proportions of one of our long ironclads (say the "Minotaur"), or with the ship having more moderate proportions (say those I will now refer briefly to another aspect in the ship having more moderate proportions (say those f the "Hercules")?

It will be obvious that this is a different case from those considered in the Royal Society paper, and one in which the disadvantage of the long ship as compared with the short ship is not so great as in compared with the short ship is not so great as in those cases. In the wholly armoured ship in pass-ing from a short to a long ship we increase the armour very largely; while in the case now about to be discussed we propose to lengthen the belted portion only, and, therefore, get the benefit of length with a less burden of armour. Still, we shall see that, even in this case, the short ship is to be

preferred to the long.

I have taken the "Hercules" as the representative short ironclad, and have used the known quantities snort from ad, and have used the known quantities representing her weights of hull, of equipment and armament, and of engines, boilers, and coals at the time of her trial, and of armour and backing on batteries and belt, in order to determine the correbatteries and belt, in order to determine the corresponding quantities in the new design for a ship having the same form and proportions below water as the "Minotaur," but in other respects fulfilling the same conditions as the "Hercules" in the manner explained above. I have also taken the indicated horse power developed in, and the full speed realized by, the "Hercules" on her load draught trial in order to determine the proportion of indicated to nominal horse power in the engines which would drive the new ship at the same speed, thus ensuring that the new ship shall have engines of an identical drive the new ship at the same speed, thus ensuring that the new ship shall have engines of an identical character with those of the "Hercules." In determining the coal supply of the new ship, I have considered it proper to provide such a weight as would enable her to proceed under the half-boiler speed attained by the "Hercules," as far as the "Hercules" could steam at that speed. This is obviously just to the long ship as the half-power speed is the maximum which would be employed in all cruising services when under steam. vices when under steam.

As the result of careful calculations made in ac cordance with the above-stated conditions, I am enabled to give the following dimensions and parti-culars of the new ship; and, in order to compare them with the corresponding features in the "Her-cules" at the time of trial, have arranged the subioined table:-

	New ship.	"Hercules."
Length between perpen-}	385ft.	325ft.
Breadth extreme	57ft. 2in.	59 ,,
Tonnage B.O.M	5,936 tons	5,226 tons
Nominal horse power	925 H.P.	1,200 H.P.
Indicated	6,585 ,,	8,529 ,,
Weight of hull	4,574 tons	4,022 tons
,, armour and backing, in belt}	1,518 ,,	1,292 ,,
Weight of armour and ) backing, on batteries)	398 "	898 "
Weight of engines, boilers, and coals	1,460 ,,	1,826 ,,
Weight of equipment and }	1,138 "	1,138 "
Displacement	9,088 ,	8,676 ,,

From these figures it will be seen that the new ship would be 60ft. longer, and 1ft. 10in. narrower than the "Hercules," and that she could be driven at the the "Hercules," and that she could be driven at the some full speed by engines having a nominal power 275-horse power less than the engines of the "Hercules." Her tonnage, however, is 710 tons greater than that of the "Hercules," and her construction would consequently cost considerably more, while her engines would cost less, and her expenditure of fuel not be so great as that of the "Hercules." Hence, apart from the question of handiness, it becomes necessary, in contrasting the merits of these ships, to determine the difference of prime cost ships, to determine the difference of prime cost approximately. Taking £55 per ton of tonnage as the cost of the hull, which is a fair average for iron-clads, and taking £60 per nominal horse power as the cost of the machinery, which is also a fair average, we obtain the following results:—

Excess in the prime cost of the cost. £

Excess in the prime cost of the hull of the new ship over that of the "Hercules"

Decrease in the residue of the residue of the state of the state

becrease in the prime cost of the machinery of the new ship from that of "Hercules" H.P. =275×60 = 16,500

Excess in the prime cost of the hull and engines of the new ship over that of the "Her-£22,550

This will, I think, be admitted to be a considerable saying, and one which can scarcely fail to show the desirability of building ships of moderate proportions

desirability of building ships of moderate proportions, even if we have to increase the engine power in order to obtain the very high speed.

There may, however, still be a suspicion in the minds of some advocates of long ships, that the additional cost of maintenance for the more powerful engines of the "Hercules" would, in a comparatively short time, make up for the difference in the prime cost, although that difference is considerable. I shall attampt to show what the difference of cost of shall attempt to show what the difference of cost of maintenance may amount to, in order to clear up this point; but, before doing so, I must draw attention to the fact that the new ship, being more than 700 tons burden greater than the "Hercules," will require an addition of at least fifty men to her crew, intended.

and that the cost of their maintenance will be considerable. Taking £70 per annum as the average total cost per man per annum, this would involve an additional annual outlay on the large ship of £3,500. additional annual outlay on the large ship of £3,500. From calculations based upon the average consumption of coal in ships with the improved type of engine, it appears that the cost of fuel in the new ship, for a day's steaming (twenty-four hours) at half boiler power, would be less than that in the "Hercules" by a little over £15. Hence it follows that the saving of wages and provisions in the "Hercules" as a contraction of the power has a result of the contraction. cules," as compared with the new ship, would cover the difference in the cost of steaming at 12 knots for 229 days of 24 hours each in the year. I need 229 days of 24 hours each in the year. I need hardly say that our ironclad ships are not under steam for anything like that time in a year, and consequently the difference in cost of fuel for the two ships would be much more than counterbalanced by the smaller expenditure required on the crew of the "Hercules."

Even if this necessary difference in the numbers Even it this necessary difference in the numbers of the crew were waived, it will be obvious, from the facts just stated, that the interest, at a low rate, on the difference of prime cost, would quite make up for the additional cost of fuel in the "Hercules," supposing her to be in commission and on general service. This matter, in my opinion, is thus placed beyond question service. This me beyond question.

Having disposed of this objection, it is only fair that I should call attention to the facts that the "Hercules," being smaller, is sure to be less costly in repairs than the new ship would be; and that the fact that she is 60ft. shorter cannot fail to render her much handier. In several parts of this paper, I have had occasion to refer to this latter feature of short ironclads; and it may be thought that undue stress has been laid upon the point. A study of the reports of the admirals of the Channel squadron will, however, show that experienced seamen also hold the opinion that handiness is one of the most important features of a ship of war. I need not quote from those reports in proof of this statement, but may add that the length of the "Achilles," "Warrior," and other of our long ironelads has again and again been pronounced so great as to inter-fere with the manœuvring power, while the shorter ships—such as the "Bellerophon" and "Lord Warden"—have been warmly praised for their handiness. The "Hercules" has also been shown On a review of the facts brought before the Insti-

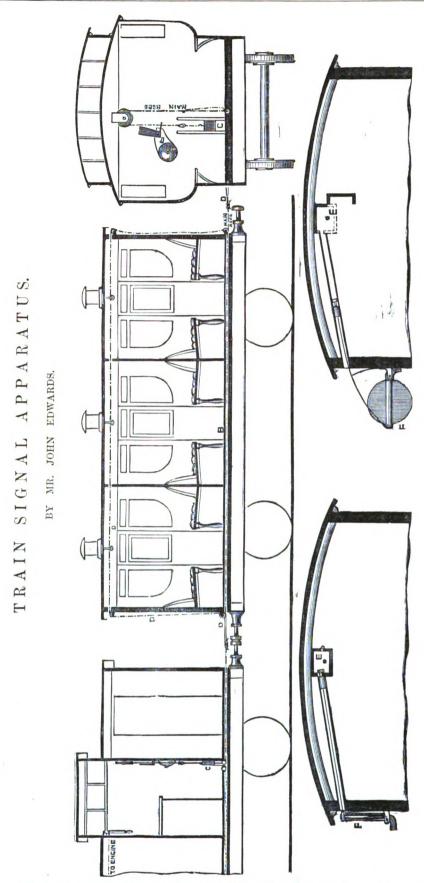
On a review of the facts brought before the Institution in this paper, it can, I think, be scarcely
doubted that the policy of building armoured ships
of moderate length and proportions is superior to
that of adopting greater length and fineness of form.
The change from the "Minotaur" to the "Bellerophon" was undoubtedly very great; but I submit
that experience has shown it to be a proper one, and
the construction and trials of other ships of nearly the same proportions have tended to confirm this view. In prime cost, handiness, and general efficiency, short ships have been shown to be better than long ships. In economy of engine power, long ships may be, and, in some cases, undoubtedly are, superior to short ships; but, since this economy is inconsiderable in proportion to the total saving, it may be fairly concluded that the shorter ironclads are, on the whole, greatly to be

preferred.

### TRIAL TRIP OF THE "HINDOSTAN."

YESTERDAY week, the "Hindostan," a fine clipper steamer for the Latinger steamer for the opium trade, was tried at the measured mile, and attained a speed of 121 knots, on a mean draught of water of 17ft., and the impression was that had the vessel been 15in. by the stern, a much greater speed would have been attained. The "Hindostan" was built for Messrs. Asscar and Co., of Calcutta, by Messrs. J. Wigham, Richardson, and Co., of Newcastle-upon-Tyne, and engined by Messrs. Thompson, Boyd, and Co. The cylinder of this vessel's engines has a diameter of 64in., with a 3ft stroke, and developed an indicated horse-power of 1,440. They are fitted with surface condensers, and all the best arrangements for economizing fuel. The circulation of the water in the condensers is effected by a centrifugal pump, made by Messrs. J. and H. Gwynne, of Hammersmith, which gave a most satisfactory result. The dimensions of this splendid steamer are:—Length, 300ft. 6in.; breadth, 35ft. 2in.; depth, 22ft. 6in. There were on board the representatives of the owners, who were in every way satisfied with the vessel's performance, and her yacht-like model called forth many compliments to Captain R. B. Durham, who has had the entire designing, planning, and superinten-dence of the vessel and her machinery. The saloon is fitted to accommodate forty first-class passengers, and, together with the sleeping borths, is most elegantly furnished and decorated; and every care appears to have been taken to adapt everything to the climate for which the vessel is





EDWARDS' SYSTEM OF TRAIN SIGNALS. A FEW days since, the system of train signals, invented by Mr. John Edwards, C.E., of No. 157, Richmond-road, Hackney, was tried at Brighton, in the presence of Colonel Yolland, the Brighton, in the presence of Colonel Yolland, the Government inspector. A train, consisting of an engine and tender, one front brake van, twelve carriages, and a brake van in the rear, was fitted with Mr. Edwards' signal apparatus, and made a run from Brighton to Shoreham and back, a total distance of about twelve miles. The system, which is called by the patentee the A B C system, is illustrated in the accompanying engravings. It consists of a cord carried through a ½in. tube B,

under the body of the carriage. This cord is coupled between the carriages by simple S hooks
To this main rope is attached a weight C in each guard's van, the one weight being heavier than the other, acting, to use a paradoxical term, as a fixed yet movable point. The heavy weight rests

a manner that the passenger is made to pull direct to the guard, who signals the driver, if necessary, by the ordinary means at his disposal. The passengers are not, therefore, in a position to signal direct to the driver, the guard's discretion being considered sufficient for the purpose of stopping where necessary or going on to the next station. As in other systems, the precise carriage from which the signal has been passed is indicated, the pull rope being passed through a mahogany case E, 2in. by 1½in., fixed to the under side of the carriage roof, the cover of which case being turned downwards acts as a detent holding up a disc fixed on the outer sides of the carriage. A passenger who may wish to communicate with the guard must open the case so as to get at the cord, and his doing so at once liberates the disc F, which then drops by its own weight into a horizontal position, was given. In the A B C system, if a train breaks in two parts, both guards are warned simultaneously by the tension of the cord, which acts as though pulled by a passenger, and, by raising the weights, the gong is struck by the arm which the small weight threw out of gear, the arm remaining rest-ing on the gong until readjusted by the guard. On the outward journey, six signals were passed from Mr. Edwards, all of which were duly received; but on the return journey twelve signals were passed, and, rather strangely, fourteen signals were received. It was noticed that the coupling-hooks prevented the rope being drawn within the tubes more than 18in. or 20in.; but if a greater length of indraw be necessary to give a signal, the system

would be perfectly useless.

Previously to the trial of Mr. Edwards' system of train signalling, that invented by Major Wethered had been tried in the same train. The latter system consists of a series of rods running on pulleys fixed below the floor of the carriage, and which are coupled to iron chains, the cord by which the passenger gives a signal being connected with the chains. The signal handle is fixed in a with the chains. The signal handle is fixed in a pigeon-hole between the compartments, and accessible to each by tearing away a paper, which covers the aperture on either side. When the passenger pulls the handle, a lever is released from its detent, the falling of which draws up the slack to the extent of 5ft. or thereabouts, and a bell or gong is sounded in the guard's van. On the signal being struck, discs and arms fall out, so as to indicate the carriage from whence the signal was passed. The trip was about twenty-two miles in passed. The trip was about twenty-two miles in length, and a number of signals were passed, which acted on the whistle of the engine on the outward acted on the whistie of the engine on the variation journey, and on the return journey were passed to the front guard's van, and from the guard direct to the driver by means of the usual connecting chain. We are informed that all the signals passed in a very satisfactory manner, except two. In the first of these instances the signal was passed from a third-class carriage, and failed to take effect a third-class carriage, and falled to take effect but from the same carriage eleven signals were subsequently given, and all were duly received. In the second instance, Mr. Craven, the locome-tive superintendent of the line, pulled the wire rope, which snapped like a piece of common twine. The rope in question had been tested to 360lb. breaking strain. Either Mr. Craven was extra strong at the moment, or the rope extra weak.

The comparative results of these trials are given in the following table, which shows the strains on the signal cords of both systems:-

Friction of cord through 12

ems:—
Wethered's Edwards'
101b. ..... 81b. 24,, ..... 14,, Wire rope. Fishing line

Friction of cord through 12 carriages 51b. ..... 3lb.
Friction through each carriage 5-12, ..... 3-12,
The Edwards' or A B C system, therefore, has the advantage of the Wethered system in the foregoing respect. It is also less expensive to apply, the cost being less than two-thirds lower than that of the Harrison system, and considerably less than that of the Wethered system. Mr. Edwards has now ascertained that the railway companies do not intend using detectors, in consequence of the extra expense. This, of course, further reduces the cost expense. This, of course, further reduces the cost of the A B C system to the merely nominal sum of 1s. 6d. per carriage, and Mr. Edwards assures us that he is prepared to supply any quantity of materials at that rate. From the position of the main rope, and the method of using it, the cost of maintenance is reduced to the smallest possible amount. Should experience prove the necessity of using detectors, they could be added to the A B C system without disarranging any of the

#### WELL FOUNDATIONS.

T a meeting of the Institution of Civil Engineers, A held March 2, 1869, Mr. C. H. Gregory, President, in the chair, the first paper read was on sinking wells for the foundations of the piers of the bridge over the river Jumna, Delhi Railway, by Mr. Imrie Bell, M. Inst. C.E.

After alluding to the native plans of sinking

wells, built of masoary or brickwork, by excavatwous, built of masoury or brickwork, by excavating the sand from the interior, at first by means of a spade called a "phaora," and after the first 5ft. by an implement called a "jham," reference was made to a modification in the use of the "jham," in constructing the railway bridge over the Jumna at Allahabad, where instead of sending down a diver to force the spade into the ground, a pole was employed to strike the butt end of the "jham" and so to drive it into the ground. This was, in the author's opinion, a decided improvement; but the process was still tedious and slow, especially where clay or hard strata were met with.

The author then proceeded to describe the mode of forming the foundations of the bridge over the river Jumna, near Sirsawa, on the Dolhi Railway. It appeared that the bed of the river at this point consisted of coarse and fine gravel and sand, interspersed with layers of blue clay 3ft. and 4ft. thick, and covered with silt; but during the rainy seasons large boulders, weighing 14lb, each and upwards, were brought down, and deposited by the scour of the river 30ft. below the level of the bed. The bridge comprised twenty-four openings, each 99ft. in the clear, and the superstructure was composed of two lines of lattice girders, resting on brick columns, or wells, each 12ft. 6in. external diameter, and 5ft. 10in. internal diameter, so that the wall of the well was 3ft. 4in. thick. In some instances, the sites of the piers were got clear of water by diverting the river at different points during the dry season, while in other cases islands were formed, by driving a half-circle of piles on the up-stream side, then lowering sand bags on the down-stream side, to the height of 4ft. or 5ft., and afterwards filling up with sand to 5ft. above low water. The curb on which the steining of the well rested was formed of wrought-iron plates and angle irons riveted together; and in cross section the curb was like an inverted right-angle triangle, of which the height was 4ft., and the base 3ft. 4in. When each curb was complete, it was moved into position, and the compartments were then filled in with concrete. The curb was next sunk by men working with the "phaora" and basket, till the upper edge was within 3in. of the level of the water, when a ring of brickwork was carried up for a height of 6ft. The excavation of the interior was again proceeded with, by means of the "jham and divers in the old native style; afterwards a further height of 10ft. of brickwork was added, but the material was now removed by a sand-pump (to be hereafter described) worked by a steam hoist of 4-horse power, as was the case after two additional lengths, each of 15ft., were built, when the well was carried down to its full depth. In operations of this nature, great care was necessary, especially at first, to insure the well, or cylinder descending vertically. For this purpose, the curb should invariably be sunk alone without any building. The first height of brickwork should not exceed 5ft. or 6ft., the next 10ft., and it was never advisable to build more than 15ft. at a time. Before commencing any additional height, the top course of the brickwork already built ought to be removed, to insure a thoroughly clean surface for the mortar.

The lime used at the works was made from marl, or, more properly, calcareous clay, which, while soft, was roughly moulded into bricks. These were stacked to dry for three or four days, and were afterwards burnt with wood in kilns for fifty or sixty hours. The flues were then closed with bricks and mud, and so allowed to remain for two or three days. On the kiln being opened, the lime bricks were unloaded almost in a whole state, were ground under stones, screened, and carried to the works pure and free from ash or dirt. The mortar was made from one part of ground lime and one part of clear, sharp sand. This mortar was used in all the well foundations of the bridge up to the level of low water; and as a proof of its quality it was stated that it was easier to break the work as a mass than to separate it at the joints or beds. Above the level of low water, the mortar was composed of white hill lime, and soorkhee, or crushed brick bats, in equal proportions, as it was found that the lime from the calcareous clay lost the greater part of its cohesion when used in work exposed to the vicissitudes of the atmospherewhether this arose from the frequent changes from drvness to humidity, or from heat or cold, was not

The well sinking for the foundations of the piers and the abutments of this bridge was completed in little more than two years, which, without deducting any time for building up the brickwork, or for that unavoidably lost by the rise in the river during rains, gave an average rate of 159ft. per month. The time occupied in the building of the steining of the wells, erecting taking down, and re-erecting scaffolding and staging for sand pump, weighting the wells, &c., was equal to that employed in sinking. This would give the rate of sinking as a sinking. This would give the rate of sinking as a little over 300ft, per month. If cast-iron cylinders had been used, the work could have been performed much more quickly, as the portions of the cylinders could have been put together more rapidly, and owing to the slight bearing surface exposed by the thickness of the iron, compared to the breadth of the brickwork in the walls of the well. The total weight of the foundations and of the iron girder superstructure on each well was 420 tons, and the area of the bottom of each well was 117ft., so that the weight was less than 4 tons per square foot.

The novelty in the sinking of the wells of this bridge was in the use of the sand pump. This was described to consist of a wrought-iron cylinder having a pump riveted to it at the top, in which was a piston fitting loosely, and pierced with small holes to allow of the escape of water. The piston rod terminated in an eye at the upper end, to which a chain could be attached. The bottom of the cylinder was movable, and in the centre there was an upright suction pipe, projecting outwards for a distance equal to its own diameter, and inwards nearly to the top of the cylinder. When the pump was lowered to the bottom of the well, the chain attached to the piston rod was worked up and down like a ringing engine. In this way, water was first drawn through the upright pipe, followed by sand or other material, which fell over the pipe into the cylinder. This operation was continued until the cylinder was quite full, which was known by the piston working stiffly, when the machine was raised to the surface; the bottom of the cylinder was then detached, with the column of sand resting on it, and another cylinder bottom which had been cleared of its sand was substituted. The number of men employed at each well was fourteen; nine working the chain, two clearing away the stuff brought up by the pump, one in charge of a steam hoist, one breaking firewood, and an overseer. The average of sinking, including contingencies, was about off. in eight hours. This rate was extraordinary when compared with the old system of the "jham" and diver, and would, it was believed, materially reduce the expense of bridge work in India.

In conclusion, reference was made to other methods adopted in this country for sinking cylinders; particularly to a machine on the dredger principle, which had been used in the construc-tion of the new bridge over the Clyde, at Glasgow, and to the excavator which had been employed in sinking the cast-iron cylinders for the foundations of the piers of a railway bridge over the same river, and which formed the subject of a separate paper. On considering the different plans, the author stated that he thought most favourably of the sand pump of Mr. Howard Kennard (Assoc. Inst. C.E.), as from its simplicity it was peculiarly adapted for India and for localities where skilled labour could not readily be procured. Some improvements which had been effected in the details were then described, particularly in the substitution of the movable bottom for the side doors as originally made, and in adapting the pump for piercing clay at the Sutlej Bridge Works.

The second paper read was a description of apparatus for excavating the interior of, and for sinking, iron cylinders, by Mr. John Milroy, Assoc. Inst. C.E. It was believed that, for the purpose of sinking cylinders, the great desideratum hitherto had been some method of excavating the earth from the interior without at the same time having to take out the water, and to keep it out during the operations. This object seemed to the author to have been attained by a machine of his invention, which was used in the construction of the bridge over the river Clyde (City) Union Railway, to which Mr. Fowler (past president Inst. C.E.) and Mr. Blair (M. Inst. C.E.) were the engineers. This machine will be found fully described and illustrated in the MECHANICS' MAGA-ZINE for May 22, 1868.

of a wheel, T-irons from a small cast-iron ring in the centre. To the bottom of the outside rim were hinged eight heavy iron spades, which, when drawn in, fitted closely, with their points pressing against the inner ring. The hinges of the spades were so constructed as to prevent them from turning back beyond the perpendicular. The whole apparatus was very strongly made, and it formed when closed a nearly water-tight tray. When the machine was descending, the spades were allowed to hang vertically, and they were forced into the ground by the aid of two chains fastened to the top of upright arms on opposite sides of the excavator, then passed down the cylinder, under a pulley, up between two leaders, and over another pulley, the end of each chain being wound round the large axle of a capstan or drum on the landing These chains were calculated when tightened to keep the machine down whilst the spades were being drawn in through the ground and up to the frame. This was effected by a second set of chains, all of equal length, and each fastened at one end to the inside of a spade and at the other to the end of a main chain, by which the machine was raised to the surface with the earth it con tained by means of a steam hoist. In order to enable an opinion to be formed of the capabilities of the excavator, it was mentioned that the progress of the excavation, and the corresponding subsidence of the cylinder, reached from about 12ft. to 20ft. per day of ten hours, inclusive of the time employed in adding fresh lengths of cylinder, putting on weights, &c. When there had been little interruption for any of these purposes, it had amounted to 25ft. in the ten hours, and then the average quantity of sand brought up at each lift was 21 cubic feet, and the total quantity during was found by measurement to be 70 cubic yards. Twelve men in all were employed, viz., one engineer, one stoker, six men working the drums, three attending to the loading and discharging of the excavator, and one man wheeling away the materials.

In conclusion, the following advantages were claimed for this apparatus:—First, that it was per-fectly independent of water, which was allowed to remain in the pit or cylinder until the excavation was completed; secondly, that it could be used, and was equally effective, at any depth, without sensible difference in the cost of working; thirdly, that its rate both of sinking and of excavating was higher than had yet been attained by any other method; and lastly, that it was not liable to get out of order, whilst its action was always in the same perpendicular line, and the expense attending its working was comparatively trifling, as skilled workmen were not required.

MILITARY ENGINEERING OPERATIONS.

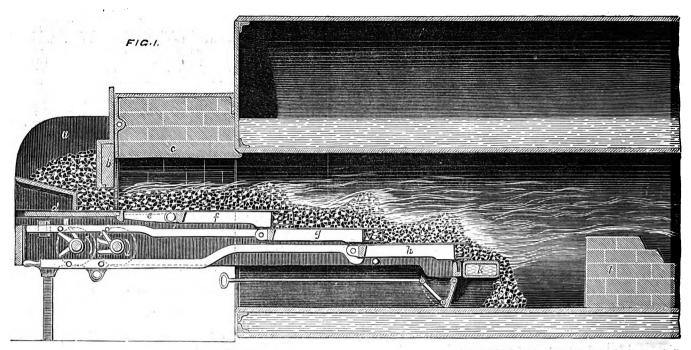
SOME interesting sapping and mining operations were carried on at Charles were carried on at Chatham yesterday week by the Royal Engineers, under the superinten-dence of Colonel W. O. Lennox, C.B., V.C., prin-cipal instructor in field fortifications at the Royal Engineer establishment, Brompton, Chatham. The object of the operations was to test the relative explosive powers of gunpowder and gun cotton when used in the destruction of permanent fortifications. In order to carry out the trials, several mines were sunk at that part of the fortifications known as St. Mary's hornwork, and were similarly placed behind the centres of counterforts of the escarp wall, between St. Mary's barrier and the batardeau, the charges being placed 11ft. below the top of the wall. Each charge of powder was of 2731b., while the gun cotton charges were each of 941b., or exactly one-third of the weight of gunpowder, gun cotton, it was asserted, having three times the explosive force of powder. The part of the fortifications operated upon were completely destroyed, although the results, so far as the use of gun cotton was concerned, were not so satisfac-factory as had been anticipated. Some further operations were also directed against the Townsend redoubt, behind the counterforts, 6ft. below the top of the escarp, and 2ft. above the bottom of the ditch, the charges used being gunpowder. The siege operations, which were carried out in the presence of Major-General F. Murray, Colonel T. L. J. Gallwey, director of the Royal Engineer establishment, and other officers, were considered very satisfactory.

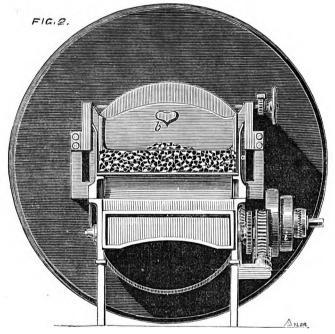
The excavating apparatus, commonly called the "excavator," was thus described:—It consisted of a horizontal frame of iron, with an outside rim opening of the Museum, free daily (May 12, 1858), 9in. in height, to which radiated, like the spokes 1,549,899.



### NEW SMOKE-CONSUMING FURNACE.

BY MR. T. WRIGLEY.





### WRIGLEY'S SMOKE-CONSUMING FURNACE.

THE annexed engraving shows a very good arrangement of furnace for the consumption of smcke, which is the patented invention of Mr. Thomas Wrigley, manager to Messrs. Fielden Brothers, of the Robinwood Mill, Todmorden. The engraving represents in fig. 1 a longitudinal section, and fig. 2 an end view of the furnace, as applied to a cylindrical boiler with one flue; it is, however, applicable to boilers of every description, and to other purposes. The furnace consists of a hopper a; the depth of feed is regulated by the door b, placed between the hopper a and the firebrick arch c. Under the hopper a is the dead plate d, connected to the grates e and f, the inner end of which overlaps the grate g, which, in like manner, overlaps the grate h. These grates are moved slowly to and fro by a strap passing round the driving pulleys i and the mechanism shown, or in any other convenient manner. Beyond the grate h is the water pocket k, the object of which is to protect the bearers of grates which would otherwise soon be burnt. The bridge l is placed a certain distance from the water pocket k, under which is a door to close the space under the grates. This door is opened occasionally to draw out the clinkers and cinders which accumulate in the

bottom of the flue between the water pocket k and the bridge l.

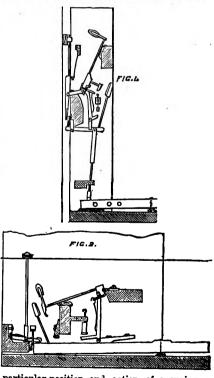
the bridge I.

The speed at which the grates move is varied to suit the coal, and the steam to be generated. But in all cases, as the coal is gradually brought forward, it is evident that the inflammable gases evolved by the fresh coal must pass over the entire surface of incandescent coal, and, consequently, be eignited before they leave the flue, thereby consuming the fuel in the most advantageous manner and entirely preventing smoke. Furnaces of this description are at work at the Robinwood Mill, where they are giving every satisfaction. They are stated to generate more steam than any furnace at present known. The labour of firing is greatly reduced, as the fireman has little else to do but to keep the hopper well supplied with coal, and the smoke is entirely consumed.

# BRINSMEAD'S PIANOFORTE REPEATER ACTION.

ROR long past, pianoforte manufacturers have sought to attain for their instruments a perfect check action, which should not affect the repetition. This they have not perfectly succeeded in doing, until the present time. There are actions

in use which profess to do it, but which practically do not achieve the object, inasmuch as their complicated nature renders them liable to derangement; besides which they do not respond to such a nicety as is required by professional players. We however, must say that the difficulty has been fairly overcome, and every requirement met in an action invented by Mr. John Brinsmead, the pianoforte manufacturer, of 18, Wigmore-street, Cavendish-square. This patent perfect check repeater action is illustrated in the annexed cuts, fig. 1 of which shows the action as applied to an upright piano, whilst in fig. 2 its application to a grand piano is seen. The substance of this invention consists in

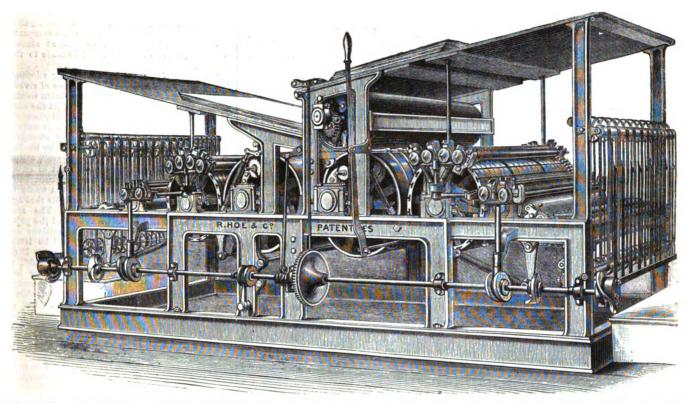


a particular position and action of a spring and loop, and informing the hopper or sticker with an incline at the top, which presses on the front of the notch after escapement has taken place. Mr. Brinsmead connects a spring to the lower part of the hopper, carries it up and forms it at the top into a hock. From the hook he carries a loop through a slot in the hopper, and connects the loop to the butt under the notch. A glance at our engraving will show the simplicity of this action, whilst its efficiency is placed beyond all doubt by



### TWO-FEEDER PERFECTING PRINTING MACHINE.

BY MESSRS. R. HOE AND CO.



an inspection of the principle as applied in practice to Mr. Brinsmead's instruments. A recent visit to the inventor's establishment assured us of this, a touch of the instrument making the point very clear. We do not, of course, refer to the matter from a performer's point of view, although we know something of that, and we know also that the arrangement is highly spoken of by the first professional players of the day. We do, however, speak of it as a mechanical arrangement, and as such pronounce it to be the most perfect we have seen, producing the most delicate repeats. To sum up, the advantages this action offers are—a perfect check without affecting the repetition, which is most prompt, acting with the least perceptible movement of the key. The touch is very sure, light, and elastic, giving the player every facility for producing forte and piano effects. The equally balanced arrangements, the absence of friction and of complication, ensure its durability, whilst the perfectness of the touch cannot fail to render it popular with players.

### HOE'S TWO-FEEDER PERFECTING PRINT-ING MACHINE.

In the annexed engraving we illustrate a new patent two-feeder perfecting printing machine for stereo plates of any size up to 60in. by 33in., and which was invented and is manufactured by Messrs. R. Hoe and Co., of No. 62, Dorset-street, Salisbury-square, London, and of New York. This excellent machine is constructed to meet the want of newspaper proprietors whose circulation is not so large as many of the London daily papers. It occupies a floor space of 18ft. by 7ft., the height being 7ft. In working, the sheets are fed in singly by two boys upon the same cylinder, and then conveyed by grippers to the impression cylinder, and thence to the forme cylinder, where the stereo plates are fastened on by means of small and convenient clips. The plates are inked while the cylinder is revolving under the inking rollers, which receive their supply of colour from a simple distributing apparatus. The sheet is then printed on one side and conveyed by grippers to the second impression cylinder, where the formes are inked in a similar manner, and perfected; they are then conveyed to the tapes, and thence to the self-acting sheet flyers, and by them laid in precision at the rate of 4,000 per hour.

The machine is specially deserving of notice on

The machine is specially deserving of notice on account of its rapid speed, compactness, and quietness in motion. It is simple in construction, not liable to get eut of order, and can be worked by

any ordinary machine minder. The first machine was made for Mr. Edward Lloyd, of "Lloyd's Weekly Newspaper," who has since ordered a second machine.

# ON ZINC SHEATHING FOR IRON SHIPS.\* BY MR. BENJAMIN BELL.

THE question of protecting the bottom of an iron ship from corrosion and fouling has always been one of the greatest interest, but, during the last year or two, my attention has been, by special circumstances, more particularly called to this subject. We have been building, at the Thames Iron Works, two corvettes of 2,321 tons each—the "Volage" and "Active," just launched for our own Admiralty—in which the object of keeping a clean bottom is sought to be attained by constructing first a complete iron hull, sheathing it with two thicknesses of wood, the first fastened with iron bolts screwed through the hull plates; the second fastened with copper screws into the first, then screwing the copper, as in a wooden ship. Two ironclad frigates of nearly 4,000 tons each have been ordered, and are building on the same plan; and a larger corvette, the "Inconstant," of 4,000 tons, has been built at Pembroke on a plan differing somewhat in detail but of the same character. In the summer of 1867, the Thames Iron Works Company, in common with other leading ship of war, and, amongst other points, were especially asked to propose any plan which they could recommend either for coppering or zincing them.

In the course of building the "Volage" and "Active," I have been very strongly impressed by

In the course of building the "Volage" and "Active," I have been very strongly impressed by the great difficulties and enormous cost of producing a perfect work of which the essential condition was the absolute insulation of the iron hull from the copper, and of maintaining that insulation throughout under all contingencies, and against all accidents. I can well appreciate the anxiety of the Chief Constructor, the designer of the ships, and his officers, that their object should, at least in the beginning of the ship's life, be obtained; and the anxiety, perhaps not less, which must arise from the consideration of the many contingencies that may hereafter defeat it, and bring together under water such deadly enemies as copper and iron. If I may venture to express an opinion, it would be that, in constructing, first, a complete iron vessel not only with iron frames, but entirely iron-plated,

· Read before the Institution of Naval Architects.

and obtaining thereby the rigidity and freedom from working of an iron hull, the best, and perhaps the only, security is obtained; but all the money and pains which have been expended are liable, over a large extent of surface, and by a variety of causes, to be at once rendered useless. The fact being well known that zinc bears to iron just the opposite relation of copper, and that galvanic action established between the two metals results in perfect protection to the iron and a corresponding exfoliation of the zinc, it would certainly seem that in its application to an iron ship, an escape from all these difficulties might be hoped.

I do not propose to go into the question of compositions. The foregoing facts are enough to show that in the opinion of the English Admiralty—no doubt the best judges of the matter, and the most deeply interested therein—no existing compositions really meet the difficulty of the fouling of an iron bottom, nor is there much prospect of success in this direction, but that we must resort to a metallic sheathing. It is, I think, accepted that no smoothness of surface, no poisonous or electrical character of the composition, will keep off the barnacle, and that the only means of accomplishing this are the corrosion and exfoliation of the surface, which, in parting with a portion of itself, parts company also with its parasites. If zinc, when acted upon galvanically, will exfoliate as the copper does on a wooden ship, and if this exfoliation can be controlled and regulated to the proper point, it would then follow that we only want a feasible method of securing it under proper conditions for this galvanic action to the iron ship to supply this desideratum. I assume that the first of these points has been settled by decisive experiments. Those made at Sheerness and Portsmouth, at the instance of Mr. Daft, and all the experiments made by the French Government, which are not a few, give decisively this result, that the zinc corrodes and kept clean, at the same time protecting the iron. As to the second, I have learnt lately that for some years past, in a large line of steamers sailing out of Liverpool, zinc has been used to protect the boilers and iron tubes, where surface condensation is practised, from being destroyed by the corrosive action of the water, which has passed through the copper condensing tubes. The plan adopted has been to hang up in each stack of tubes a large piece of zinc suspended in the water; this is rapidly destroyed to such an extent that fin. of zinc disappears in less than a month, while the boiler itself and the iron tubes are completely protected.

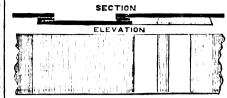
On wooden ships, zinc, as a sheathing, has l

On wooden ships, zinc, as a sheathing, has long been used as a cheap substitute for copper for the

sake of protection against water, and for comparative cleanliness. Here there is little or no contact with iron, a very small amount of galvanic action, and consequently, a small exfoliation of the zinc which lasts for years almost uninjured. not, therefore, keep the bottom as clean and bright as copper, but it approximates thereto, pays for its use, and is better even thus than nothing. It appears to be the irresistible conclusion, from facts like these, that we have the exfoliation of the zinc completely under control from the minimum on the wooden ship, with little iron contact, to the maximum in the water and steam of an iron boiler: and, this admitted, that we have only to get a combination which will make the zinc exfoliate at the same rate as the copper on a wooden ship to obtain the same result of a clean bottom. We have then to attach the zinc to the iron bottom, and to do so under suitable conditions for regulating the galvanic action; and it is with this proposition that I have attempted to deal. Two methods have been proposed and experimented upon, both of which go upon the supposition (in which I entirely conthat, in some form or other, wood must be used as an intermediary between the iron and the zinc; no plan of attaching it by cement or adhesive compounds has given the smallest hope of success. One plan, that of Mr. Lungley, has been to coat the iron ship completely with wood, secured by channel iron riveted to the ship's side, and then fastening the zinc as the sheets of copper are fastened to an ordinary ship. The other, that of Mr. Daft, has been to leave a small opening between all the longitudinal and vertical edges of the plates. filling in this with a tongue of compressed wood, and fitting sheets of zinc of such size that their edges exactly coincide with these tongues, and fastening them thereto with nails. In the former case, as the conditions appear almost identical with those of a wooden ship, and the galvanic action a minimum, much difference of result could hardly be anticipated, and, so far as I am informed, such was the result of an experiment which has been To the latter plan, the objections have been urged that a fastening only by the edges of the sheets of zinc to so small a tongue of wood could hardly be depended upon, and if supplemented by fastenings into the central parts of iron plate, great cost would be involved, while it was not desirable, in view of structural strength, to separate the butt edges of the plates of an iron ship. I have no disposition to exaggerate or even to enforce these objections, but they have hitherto prevailed to prevent any ship from being built on this plan, and it is certainly exposed to this difficulty, that to try it fairly requires a very large ship to be built. The tongues of wood can only be as thick as the plates between which they are placed, and, in small ships with thin plates, this would give no sufficient foundation.

The plan which I propose may be regarded as a mezzo-termine between these extremes, with the advantage of being available for every size of ship, and having great elasticity in its application to produce whatever amount of galvanic action may be found on further experience desirable. It has already been proposed, as a method possible of application to our largest ironclads, to fill up the hollow in the side of the ship, between the inside and outside strakes, with wood, and to fix the sheets of zinc over, and in contact with, the iron surface, fastening them into the wood. This would give a flush surface to the ship, a proportion of shout one-half of contact with iron and with wood which would probably give a very good result as to cleanliness. I have myself recommended strongly in certain quarters the trial of this plan; it is, in fact, out of this that my present proposition has arisen, but the objection has provailed, and I have felt compelled to acquiesce in it, that a thin filling of wood \(\frac{1}{2}\)in. to \(\frac{3}{4}\)in., which is about what our largest ships will allow, would be of doubtful sufficiency to hold on the zinc. It is precisely with this insufficiency that I have proposed to deal, and I submit two alternative methods of doing so. What is done is simply to increase this hollow to such an extent as to give a thickness of wood strong enough to hold securely the fastenings of the zinc. One of these methods is adhering to the ordinary plan of building the ship with longitudinal lap joints, giving an inside and outside plate to interpose between these laps before riveting them together, a band of iron, the breadth of the laps of the necessary thickness increasing thereby the relief of the outside plate; single riveted, and no sign of weakness has the other, which is in principle the same, is appeared from this cause. So far as the structure adopting a method sometimes used to have all the plates home to the frames, with flush edges, and laps is equally applicable to double or single rivetto rivet these together by an outside longitudinal ing, but this has an important bearing on the

butt strap, increased beyond the ordinary proportionate thickness, due to the strength necessary for the connection of the plates to that required for giving the relief wanted for a wood filling sufficiently strong, as in the former plan. In the drawing, I have taken §in. as an average thick-



ness of a ship's plating, and have inserted between the laps a gin. strap, giving thereby a hollow of 14in., which, filled in with wood, should, I think, be strong enough to hold the zinc. In the other plan, the same result is produced by putting on a butt strap or outside plate 14in. thick; this has been taken on the assumption that wood 14in. thick is the proper strength to hold the nails securing the zinc, but obviously the plan permits of this thickness being either diminished or in-

creased as experience may prove desirable. With respect to the bearing of these plans on the structural strength of the ships, I would observe that they are both simple, involving nothing in principle novel or difficult, or materially differ-ing from the ordinary forms of iron shipbuilding. To the latter form, that of the outside butt strap, no structural objection has occurred to me. There are, indeed, advantages in having all the plates home to the frames, and all the edges supporting each other. To the first form, that of the strip between the laps, it did at first occur to me that the riveting of three thicknesses instead of two was, per se, objectionable, and that the separation of the two lapped plates might, by increasing the leverage where strains come on the ship, increase the power of shearing or bending the rivets. to the first point, however, I have considered that in ships built with plated keels we are continually riveting together five thicknesses of iron, i.e., the keelson, the two outside keel plates, and the two garboard strakes, and find no practical difficulty nor objection to doing so. As to the second, I have made some experiments which have led to the conclusion that there is no real disadvantage, but rather the reverse. The introduction of the strip rather the reverse. The introduction of the strip between the laps adds just 50 per cent., or what is due to the increased section of iron to the power of the lap to resist all longitudinal strains. transverse strains, there is no difference, because the real point of weakness is at the rivet holes where the sectional area is most reduced, and where, from the necessity of caulking, the space between the rivet holes is fixed at a maximum that cannot be exceeded. There is no question of shearing or breaking the rivets themselves because, as riveting is now done, the power to resist this is always much greater than that of the plate itself, weakened by the rivet holes. Here is a point of minimum strength which cannot be helped. Undoubtedly, if it were a question only of two plates riveted at the laps, the two plates would always break across the rivet holes, and those with the strip would break sooner that those without, simply because they would be more distorted, the pull not being in a direct line. But then this is not the case in a ship, because the frames and stringers, and the whole combination of the ship, tend to keep the plates in the direct line. As against buckling, the plan will give greater power of resistance: the double lap will give that; the thickened liner will, so far as it goes, give the same result, and the wood filling will also give some addition of stiffness to the side.

Considering, in fact, that for all longitudinal strains the lap is made absolutely stronger than an equal portion of the solid plate, I express the opinion, as worthy of consideration, that on this plan there is no necessity for double riveting. It adds nothing at all to longitudinal strength, and little, if anything, to transverse strength, and the plan proposed adds to the strength of the ship in the direction where it is really needed, and, if it does at all reduce it, it does so where it is least needed. I am not aware of any instance in which a ship has been lost by a failure in a transverse direction of the riveting, whether double or single. The largest ship affoat, the "Great Eastern,"

question of cost. I have gone into this with reference to a ship like the "Volage," and have found that, supposing no change to be made otherwise in the ship, she could be sheathed and zinced at a cost of less than £1 per ton over the ordinary plan, and an addition of half an inch to her draught. But, if I am right in supposing that double riveting can be saved, then the compara-tive increase of cost would be reduced almost to nothing, and no increase would be made to the draught.

In the case of the outside strip being adopted. there would necessarily be a double row of rivets, and some addition to cost, but this addition would, I think, be very trifling, considering that the outside strips would contribute to longitudinal strength, and the liner is entirely saved, which is only a filling, and does little duty in giving strength, while the lateral strength is increased by having all the edges of the plates supporting each other. I think on this plan a ship can be built of equal strength, with no addition to the total weight of iron; the wood need only be fillings, the waste of a yard, put on diagonally with a few bolts through the side here and there to fix it. The zinc sheathing costs little, less than a third the price of copper, while all expensive compositions are saved. The first cost, therefore, will be little, and would soon be well repaid, doing even little better than size or model at the costs. better than zinc on wood at present : it would, at least, keep clean longer than paint, require less frequent docking, and reduce the time and cost of At present, the cost of docking. that operation. cleaning, and painting an iron ship is 2s. a ton, or £200 for a ship of 2,000 tons, and it requires four or five days in dock. While the zine lasts—and I have an instance of its lasting seven years on a wooden ship, without being removed even to caulk the bottom--no painting is required; the bottom could be cleaned as the water leaves the ship in dock, and one tide would suffice for the operation, and one-third of the expense.

To one feature in these plans I attach very great importance, i.e., their elasticity and the power of varying their application, as experience may show to be desirable. We can give any thickness we please to the wood for holding the nails simply by to be desirable. increasing or diminishing the strip. We can do this on a ship of any size, and what is, perhaps, the most important of all, we can regulate at pleasure the proportion of contact between zine and iron. It is simply a question of the breadth of the plates, and in that part of the ship coated ith wood the galvanic action can be encouraged, if necessary, by driving the nails quite through and home to the iron. I am informed that this has been discovered and acted upon of late in wooden ships sheathed with zinc. They are now increasing the number of iron nails fastening it. and providing that all iron bolts in the ship touch the zine instead of being kept apart from it, and they have found that just in proportion as th y do this they get a cleaner bottom. No facts, which in studying this question I have learnt, have been so satisfactory and so conclusive as those which bear upon this point. They go completely to They go completely to establish the proposition that the zinc protects the iron, and that its cleanliness is simply and directly proportioned to the contact of the metals and the galvanic action.

In submitting this proposal to the First Lord of the Admiralty and the Chief Constructor of the Navy, I have learnt from Mr. Reed that the plan adopted by him in building the "Inconstant." to which I have referred as differing from the "Volage," is substantially the same, although for a different object, as that of the outside strip. her case, the plates are all flush longitudinally with a thick outside butt strap, the hollows between being filled in with wood. This strip was introduced to afford a means of fastening the thickness of wood, which is secured by screw bolts tapped into this strap, so that no holes are made through the side of the ship. To this the second wood sheathing is fastened, as in the "Volage." It seems to me very likely that I am here to-day simply because Mr. Reed was thinking of how to get the copper on to his ship, while I have been thinking of how to get the sing there. thinking of how to get the zine there. I have been able to say (and this is the proposition now before the Admiralty) you can try the experiment I propose without doing anything that you have not already done up to a certain point, and with the power, if the experiment does not succeed, of going beyond that point, and doing all that you have already done in the "Inconstant." You have only to build the "Inconstant" up to the point of the outside strip, and wood filling in between, with no other difference than that of putting

the edges of your strip at such an angle to the side as will hold on the wood, and stopping there to apply the zinc sheathing. If this succeeds, you save a great expense; if it fails, you can take off the zinc and go on and complete your ship with the wood and copper, like the "Inconstant."

It would be difficult to imagine more favourable conditions for trying an experiment, on which results of such immense importance hang. I need not here insist on the advantages which will be gained if this plan of zincing succeeds; if it does, it will follow that the iron ship can go on any distant station for long service; that the great cost of repairs of wooden ships, as compared with which iron ships cost almost nothing, will be saved. It signifies that as it is certain the iron will be absolutely protected against injury from without, you have an imperishable ship. It signifies that a clean bottom means a higher speed maintained, or an economy of coal, and a power of steaming a greater distance with the same quantity, a reduction of docking and of its cost. Supposing even that the zinc should not be quite equal to the copper, there are still the advantages of a flush surface, which will add to speed, and of facility for hogging when at sea, the preservation of the ship, and a better bottom than any merely painted one.

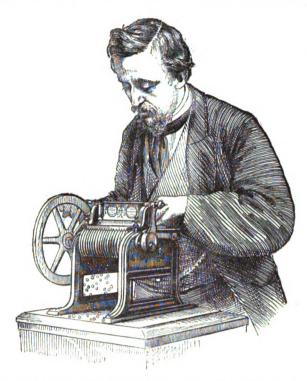
better bottom than any merely painted one.

Perhaps I can give no better measure of the importance of this question than is founded on what has been done by our Admiralty in the five ships to which I have referred. The addition to the cost of these ships, caused by the wood sheathing and copper, is not less than £6 or £7 per ton, as compared with what they would have been in iron ships; this means that the Admiralty have thought it wise to spend £100,000 or £120,000 for the sake of the advantage of such a clean bottom as copper gives. In spite of all the risks which it involves, beyond question, the advantage is worth all and more than the cost while it lasts; and it is sought to be effected by methods on which every skill and care has been expended in order to make them successful. But I found on this an argument which I trust will prevail for making an experiment which involves no risk, can result in no loss, and affords, at least, a fair promise of success. After what has been, it would seem to be impossible to go back to a mere iron ship, with paint or composition on her bottom: you must have a metallic sheathing. If that must be copper, then, even if it be true, as said by a leading scientific journal, the other day, of the wood and copper plan, that if that be the best plan, then bad is the best; we must do the best, however bad. But I say, build the ship so that you can try first the zinc. If that succeed, you have made a great economy; if it fails, then you have lost little, and can go on and fix the copper. The question has, I think, gone beyond the stage of mere experiment on parts of a ship; it should be fairly tried on a ship at sea. Doubtless there is much to be learnt which can only be learnt in that way; much may be necessary to settle completely the problem. I have strong faith that this is the true direction, and shall be more than content if I have contributed even a step to its final solution.

### BUSHBY'S PILL MACHINE.

THE accompanying engraving, which is of a somewhat more artistic style than we usually indulge in, serves a double purpose. It illustrates an ingenious pill-making machine, and at the same time presents an example of the graphotype process of drawing. The pill machine is the invention of Mr. Bushby, and is now rapidly being introduced here, and in America and France, where it is patented by Messrs. J. Bailey and Co., of the Albion Works, Salford, Lancashire, the well-known makers of patent mechanical novelties. Many attempts have been made to make a machine for this purpose, but without complete success. The inventor in the present case being a practical chemist, has so perfected the invention that 1,000 pills a minute are now made with ease. The following description may enable an idea to be formed of its principle:—The "pill mass" is first passed between two plain rollers to form it into a sheet of the thickness required for the size of pill to be made. The sheet then passes to the table of the pill machine, where it is caught by a self-acting feeding apparatus, bringing a portion under the edge of a knife, which cuts off a strip or bar, the strip falling or being carried by the knife between semicircular grooves, which, revolving rapidly, cut and form the strip into pills. The great economy of time will be apparent.

### BUSHBY'S PILL MACHINE.



sheet being intermittently advanced as each strip is cut off and formed into pills, another instantly follows, the shower of pills being continuous as long as the necessary sheet is supplied. The pills formed are spherically rounded, and by care in forming the mass into sheets of the required width, which is provided for on the plain rollers, a great quantity may be made without the waste attending the old process by hand. The machine is not liable to get out of order, the workmansnip being good and the mechanism simple—its great merit.

Pills are cheap enough now, in all conscience; for a shilling and three halfpeace we may enjoy weeks of internal disquiet at the hands of Cockle, Parr, Holloway, Morrison, and others. But we shall now have them cheaper than ever—or, at any rate, we ought so to have them by this labour-saving machine. But there is an evil in having pills too cheap as well as too dear; they may lead to over indulgence by those who have a morbid inclination in that direction. We are hereforcibly reminded of an anecdote told of the late Richard Roberts, the great inventor, who had a housekeeper whose ruling passion was a craving for pills. The worthy dame always had some imaginary ailment, and the most curious part of it was that she thought any pill of any kind good for her. Mr. Roberts suffered much from drinking water impregnated with lead, and had pills specially prepared to meet the case, and which he took at regular intervals. Somehow or other, the pills continually disappeared, and having an idea who abstracted them, Mr. Roberts devised a means of curing the pilferer. Being at his birthplace, Llanymynech, in North Wales, he gathered from off the Welsh hills a few of those small black rotundities to be found wherever sheep and goats abound. These were duly ensconced in pill boxes, and when he returned to his house in Bloomsbury-terrace, Lower Broughton, Manchester, Mr. Roberts placed them where he usually kept his pills. By degrees, the new pills gradually vanished; so the servants were called together, and told in a solemn manner of the importance of the pills to Mr. Roberts, on account of his complaint. Mr. Roberts also told them that he knew who had taken the pills, and that if the offender would confess and promise not to repeat the offence, he would overlook the matter and forgive the theft; otherwise, dismissal would follow. The servants went out in silence, but the housekeeper shortly afterwards returned, and, conscience smitten, begged forgiveness, at the same time stating her ailments and her reasons for taking the p

Turning to the second feature of our engraving —the illustration of the graphotype process—we

may observe that a full description of the system appeared in the MECHANICS' MAGAZINE for December 15, 1865. But as some time has elapsed since then, it may not be out of place here to state briefly the details of this invention, which is briefly the details of this invention, which is intended to take the place of wood engraving. The graphotype is the invention of Mr. De Witt Clinton Hitchcock, an American artist. The process is a very simple one. An artificial tablet of smooth chalk is obtained by reducing the finest French chalk to powder, and mixing it with water to the consistence of cream, separating the parts that precipitate, and repeating the operation several times to ensure an impalpable powder, capable of forming by compression a smooth, uniform sub-stance. This is spread evenly upon a smooth, level plate of zinc, over which a flat plate of steel, with a finely-polished surface, is laid above the chalk, which rests between the two metal plates. The whole is next submitted to the action of a hydraulic press, and put under a pressure of about 150 tons, which consolidates the chalk into a hard cake, with a surface like polished ivory. a wash of strong size is placed to guard against the possibility of the ink being used too thin, and so thickening and blurring the lines by spreading laterally. On this the artist makes his drawing, with the same care and lightness of touch, and in just the same way as line drawings are made on lithographic stones, with a brush specially pre-pared, and with a paint-like ink, principally com-posed of glue and lamp-black, with a little gly-cerine. When the drawing is made, it can be engraved in a few minutes, by being subjected to the action of a machine, which presses and whirls a brush with great rapidity on the surface, and by working downwards at right angles to the plate, working downwards at right angles to the plate, soon removes all the chalk not protected from its action by the artist's lines. The drawing is then in relief, and after being acted upon by a solution of silicate of potash, which gives it a stone-like hardness, is placed in the hands of the electrotypist, who produces an electrotype of it for the printer, just as he does from an ordinary wood engraving. We had almost omitted to mention that the illustration serves wet another and third that the illustration serves yet another and third purpose. The engraving is made from a photograph of Mr. W. H. Bailey, the energetic proprietor, of the above firm of J. Bailey and Co., and the inventor of many useful things, well known in the manufacturing districts. His patent improvements in pyrometers we hope shortly to illustrate and describe.

AT the ordinary meeting of the Society of Engineers, held on Monday the 19th inst., Mr. F.W. Bryant, President, in the chair, a discussion took place on Mr. F.W. Hartley's paper on "The Methods Employed in the Determination of the Commercial Value and Purity of Coal Gas."



### ROYAL HORTICULTURAL SOCIETY

THE second spring flower show of the Horticultural Society took place on Saturday last and notwithstanding the unpropitious weather which prevailed, the attendance was very large. The flower show was remarkable for the display of auriculas, cinerarias, and calceolarias. The miscellaneous plants were also very good and numerous. The principal prizes were:—For six azaleas, distinct, amatours, Mr. G. Wheeler, gardener to Sir F. H. Goldsmid, Bart.; for the like, nurserymen, Mr. C. Turner, of Slough; for best single specimen of azalea, open, Mr. A. Wilkie; for six cinerarias, distinct, open, Mr. J. Dobson and Sons; for six calceolarias, distinct, open, Mr. J. James; for twelve camellias, cut blooms, six kinds, open, Mr. A. Wilkie; for six camellias in flower, distinct, open, Mr. A. Wilkie; for nine auriculas, edged, disopen, Mr. A. Wikie; in inhome auriculas, selfs and fancies, distinct, open, Mr. C. Turner; for nine auriculas, selfs and fancies, distinct, open, Mr. C. Turner; for six cyclamens in flower, amateurs, Mr. J. Wiggins, gardener to W. Beck, Esq.; for bost miscellaneous collection of plants in flower, open, Mr. W. Bull. Of the calceolarias, the beautiful purple crimson flowers of the variety called Lord Elgin were most noticeable; and the cut camellias were very lovely. In Mr. Bull's collection there was amongst new and rare plants a very fine Pitcairnia tubulæformis, and a luxuriant Adiantum Farleyensis. Mr. Lane's very fine collection of plants in the corridor excited a good deal of notice.

VISIT OF THE CIVIL AND MECHANICAL ENGINEERS' SOCIETY TO THE SOUTH-ERN THAMES EMBANKMENT AND ST THOMAS' HOSPITAL.

UNDETERRED by all the disagreements of a very wet afternoon, the members of the above Society, including many visitors, made a tour of inspection, on Saturday last, of the works in progress on the south side of the Thames, from Westminster to Vauxhall-bridge. They were first conducted over the partially-erected hospital, examined and admired the plans, the design, the materials, and the workmanship, and visited the numerous sheds and temporary foci of industry attached to the permanent structure. Unfortunately, the day selected, and the hour at which the inspection took place, did not permit of the party witnessing the actual working of any of the machines calculated to lighten manual labour, and facilitate the dressing of the stone wall employed in the ornamental portions of the edifice. Some of the mouldings were of exceedingly beautiful proportions, and the workmanship of the stones was soadmirably performed that the lines and arrises were nearly as sharply defined as in the templets themselves. With the exception of the indispensable wooden fittings pertaining to windows, doors, and other interior accessories, the whole building may be considered fireproof, being composed of stone, brick, iron, and concrete. This precaution is all the more necessary, since a large number of the future inmates would be quite unable to assist themselves, in the event of a fire taking place. Those who are desirous of witnessing the improvement effected in this part of the metropolis, by the crection of this magnificent structure, should not content themselves by simply walking along the embankment, and viewing the river facade of the hospital, but should pass down by Stangate, and walk along Palace-road, which extends at present from Westminster to Lambeth-bridge, and will eventually debouch at Vauxhall. For sold dity of construction and width, this road will bear comparison with any in London.

and will eventually debouch at Vauxhall. For solidity of construction and width, this road will bear comparison with any in London.

The inspection of the hospital finished, the members proceeded to Lambeth, and viewed the nearly completed embankment, extending from that locality nearly to Vauxhall-bridge. The machine for cement testing was the first object claiming attention from those who had not seen its prototype at the Crossness Works, but as most of our readers are already familiar with the nature and use of this valuable little apparatus, there is no need of further comment respecting its duty and performance. At certain points along this portion of the embankment, there are openings to allow ingress and egress at low water into small docks. The roadway is carried over them upon castiron girders and brick arches turned from flange to flange, constituting a solid and permanent method of accomplishing the job. The entrance to the docks is, therefore, a short tunnel. Were we disposed to be critical, it might be remarked that there appeared to be rather a redundancy of metal in the girders, and their form and section were hardly consistent with scientific principles. At any rate, they are strong enough, which is being on the safe side, at all events. As there is no necessity for waiting for the paving of the roadway, it cannot be very long before the public have the benefit of this fine thoroughfare, instead of being at present compelled to make their way through the back alleys running parallel to the river from Lambeth to Vauxhall.

THE APPROACHING TRANSITS OF VENUS.

A N important question has been raised respecting the two transits of Venus, which were discussed at the Royal Geographical Society a few weeks ago. It may be remembered that Commander Davis, in describing the preparations which were to be made for Antarctic expeditions to observe the transit of 1882, quoted the statement made by the Astronomer Royal, that the transit of 1874 will be wholly unsuited to the particular mode of observation he was considering. This statement has now been called in question. M. Puiseux, a well-known French mathematician, and Mr. Proctor, the author of a treatise on the planet Saturn, have by independent processes, arrived at the conclusion that astronomers cannot do better than to apply to the transit of 1874 the old-fashioned and simpler mode of observation which Mr. Airy had rejected as unsuitable. A discussion of the nature of the famous problem of determining the sun's distance by observing Venus in transit would be much out of place in these columns. It may simply be stated that, as usually applied, the method resolves itself into a comparison of the durations of transit, as seen from a northern and from a southern station. The greater the difference of duration the more effective is the method. If one could find one station where the transit began as early as possible, and ended as late as possible, and another where these conditions were reversed, we should have precisely what is wanted. But astronomers have to be context with only an approach to these conditions, and it happens that in 1874 the approach will not be so close as could be wished. The Astronomer Royal, therefore, suggested that instead of sending out observers to places where the whole transit could be seen, we should send one set of observers to a place where the transit will begin as early as possible, another set to a place where the visit of sending out observers to places where the whole transit could be seen, we should send one set of observers to a place where the transit will begin as early as possible,

vitiate the resulting estimate of the sun's distance in an appreciable manner.

M. Pulseux has shown that the simpler method can be made use of effectively. He names places where the difference of the duration of transit is as much as 30min., whereas the greatest interval by the Astronomer Royal's method is but 22min. But Mr. Proctor goes much farther than this Indeed, Puiseux's reasoning is hardly sufficient, as Mr. Airy has shown, to establish the superiority of the simpler method. Mr. Proctor shows that by attending only to the particular appearances which observers are required to watch, the superiority of the simpler method is much more strikingly exhibited; and not only so, but that the transit of 1874 is shown to be clearly superior to the transit of 1882, and also to the famous transit of 1769. The appearances referred to are what are called the internal contacts of the planet with the sun. All calculations of the sun's distance have been founded on observations of the moments when the planet is just fully seen within the disc of the sun, after ingress, and before egress. Neither Mr. Airy nor M. Puis-ux seem to have paid sufficient attention to this circumstance. It now appears that whereas the greatest observed difference of duration was less than 24min., in 1769, and will be but 28min., at the outside, in 1882, it will be possible to find places in 1874 giving a difference of fully 36min. The full mathematical details of the correction are presented in the monthly notices of the Astronomical Society, and the next number of the "Quarterly Journal of Science" will contain a more popular statement of the facts which are in question. Fortunately, there is still time to make preparations for applying the simpler mode of observation suggested, should astronomers decide that Mr. Proctor's statements are valid. Antarctic journeys will have to be made to the very stations discussed by Commander Davis six weoks ago.—"Daily News."

### THE WATER WORKS OF ROUEN.

THE admirers of the French regime take an especial pleasure in the repetition of the somewhat hackneyed phrase, "They manage these things better in France." With all due deference to the occasional truth of this observation, there are very many matters which, in our opinion, we manage a great deal better in England. Among these are all works, particularly those on a scale of importance and magnitude, which are intended to improve the sanitary condition of our large centres of manufacturing and commercial industry. There are a from this from this few exceptions in France, but, as a general rule, the drainage and sewage of continental towns are a hostility.

mockery of all the laws of hygiene, and a total neglect of every consideration for the health and social comfort of the inhabitants. Gradually, foreign local authorities, and those upon whom rests the responsibility of all such measures, are awakening to the necessity of executing works of this description, and, in the first place, of ensuring an abundant and constant supply of pure and wholesome water. As a means of supply, wells, when they are in the vicinity of a town, are now regarded with universal suspicion, and springs that formerly sufficed for the inhabitants no longer afford an adequate yield for a population that annually increases in geometrical ratio. It is not sufficient to provide for the present. A liberal allowance must be made for future contingencies. It is scarcely necessary to enlarge upon the numerous causes that have tended to render indispensable a better supply of water to the majority of the English as well as the continental principal towns. In many, the recent establishment of breweries, paper mills, dye works, and other large industrial premises, have literally "swamped" the supply hitherto available, while the improved means designed for the extinction of fire cannot be adopted with success unless there be plenty of water at hand. These and other causes have mainly contributed to demonstrate that no town can expect to occupy a prominent position as a leading manufacturing or commercial centre if it should lack this essential characteristic of the progress of the times, and one so indispensable to its inhabitants.

commercial centre if it should lack this essential characteristic of the progress of the times, and one so indispensable to its inhabitants.

The corporation of one of the oldest towns in France, and one rich in historic associations, has recently taken action in this question, and authorized the ratepayers of Rouen to contract for a loan of £100,000, to construct water works that shall afford an adequate supply of water. In this instance we have the old story over again of uncertain and polluted sources, dried up in summer, overflowing in winter, but never at any time, in either summer or winter, fit to be drunk by man or beast. The platn upon which the city is situated is watered by the Seine and the rivers Aubette and Robec, but they are all strongly contaminated by the centents of sewers and the innuncrable miscellaneous abominations and refuse that are poured into them from the different manufactories established upon their banks. Another serious and insurmountable evil is that the level of the River Seine at Rouen is only 3ft, higher than that of the sea. There is therefore not sufficient fall to carry away the impurities that are incessantly launched into the stream. Besides, the tide rises some distance up the river, so that there is a continual come-and-go movement, which amalgamates the whole mass of filth, and renders the water little better than a slow poison. The rivers Aub-tte and Robec are pretty much in the same condition, so that it is idle to think of any of these three constituting a proper source of supply. As may be imagined, when the rivers are so foul, there is not much to expect from the wells in their neighbourhood, and the only chance left to the inhabitants is what they can catch and store in cisterns and reservoirs. So long as there is plenty of rain this plan succeeds tolerably well, "faute de mieux," but in time of drought then come the deprivation and suffering. During the long-continued drought of last year these supplies were totally exhausied, and water was so searce and diffic

it was sold in the higher parts of the town at sixpence a small cask. When so high a price was paid for a supply of this necessary for drinking and culinary purposes, it can be readily anticipated that very little found its way into the sewers. They were therefore left unflushed, deposits accumulated in them, and from their putrefaction arose cultuvia and emanations which threatened at one time to

occasion a serious epidemic. Ever since, the inhabitants have been alarmed at the possibility of

inhabitants nave been aramed at the possibility of this calamity occurring at some future period, and so much pressure was brought to bear upon the local authorities that they have at last set themselves to work in good earnest to radically cure the

Making the most of the old sources of supply, they were equal to 400,000 gallons per diem, and it is now proposed to furnish a daily supply of 3,000,000 gallons. Although it would not be possible, with a due regard to the purity and potable nature of the water, to use the Robec as a source in its course through the town, yet there would manifestly be no objection to making it available by taking the water at a higher level, where it would be uncontaminated. Three of these sources exist at a distance of four or five miles from Rouen, and have an elevation of 220ft, above the mean sea level. They flow out of the side of a chalky hill, and yield on an average 60 gallons per second. In seasons of drought the supply is about 30 gallons, and during floods nearly 90 gallons per same unit of time. To obtain the quantity already mentioned for the daily requirements of the town, it would be necessary to impound, in time of drought, the whole of the supply from this source. Against this proposition the inhabitants of the valley of the Robec very naturally protested in the strongest terms of indignation and hostility. Fortunately for the projectors and

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advocates of the new undertaking, as well as for the residents in Rouen, there are other sources, in different parts of the valley, which can be made use of without interfering so seriously with the interests of the cultivators of the soil. It was also discovered during the preliminary investigations and examinations of the locality that took place consequent upon the discussion of the question, that an additional supply of 20 gallons per second could be obtained from the three sources first contemplated by lower-ing the outflow or mouth of exit without interfering ing the outflow or mouth of exit without interfering with the rights of the present land occupiers. Another piece of information was likewise elicited which was of very material importance. It was ascertained that underneath the hills encircling the town was situated a vast bed of chalk, free upon the upper surface, and containing in its innumerable crevices and fissures a large supply of water, continually renewed by rain and infiltration. To drain this bed in order to reach the source all that is required is to construct a tunnel, which at the same time could be used for the reception of the same time could be used for the reception of whatever amount of water it might be determined to take from the river Robec. After mature and deliberate consideration of the proposed scheme, the chief authorities of State decided that the mouth of centerate consideration of the proposed scheme, the chief authorities of State decided that the mouth of the outflow might be lowered and the tunnel constructed, but that no supply was to be drawn from the Robee above the level of such altered outflow until the tunnel was completed and all the water obtained that could be procured by the tapping of the chalk stratum. It is also provided that whatever quantity of water may be taken for the use of the town there must be a minimum supply, even in times of drought, of 10 gallons per second secured to the inhabitants of the valley, and an indemnification granted to them for any loss they may sustain from being reduced to so small a supply. Ten years are allowed for the repayment of the loan, but there is no doubt that if the anticipated supply can be obtained there will be little or no difficulty in procuring ample funds for that purpose.—"Building News."

### LOCAL ATTRACTION.

COLONEL SIR HENRY JAMES, Director-General of the Ordnance Survey, reports that during the past year inquiry has been prosecuted observes that the relative extent to which the plumb line and the levels of our astronomical instruments are affected in a country where there is nothing on the surface of the ground to account for it, may be judged from the fact that it is nearly double the amount of the deflection on Schehallion mountain, 3,547ft. high, with the instrument placed on the sides of the mountain that the mountain the structure of the sides of the mountain that the mountain of the sides of the mountain that the mountain that the mountain the sides of the mountain that the mountain the sides of the mountain that the sides of the sides of the mountain that the sides of the itself, at one-third of its allitude, the position to produce the greatest effect from the mass of the mountain on the plumb lines. He considers that we have very decided indications that the cause is in the granitic rocks which extend in a south-west direction from Cowhythe through Banffshire, and which are highly impregnated in some parts with magnetic iron in a metallic state. The range of mountains on the south-east of Banffshire culminates in Ben Muich Dhui, 4,295ft. high, which, after Ben Nevis, 4,406ft. high, is the highest mountain in Scotland. The great amount of the attraction at Cowhythe, and along the coast to the east and west of Portsoy, cannot be explained by anything visible on the surface, and obliges us to imagine the existence of some large and very dense mass of matter underneath it. Sir H. James hopes to resume this important inquiry this season; and the geological structure, as well as the mineral character, of the rocks, will be carefully investi-gated by the Director of the Geological Survey of Scotland.

SCIENCE AND ART .- A striking instance of the SCIENCE AND ART.—A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointtion of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVI.]

# Megal Intelligence.

# COURT OF COMMON PLEAS. April 16.

(Sittings in Banco, before Lord Chief Justice BOVILL and Justices KEATING and SMITH.) EDMUNDS v. GREENWOOD.

It is hardly necessary to remind our readers that this action was brought by Mr. Edmunds, the late Clerk of the Patents, to recover damages for libel; and the statements complained of occurred in reports made by Messrs. Hindmarch and Greenwood to the Commissioners of Patents. When the case was down for trial, an agreement between counsel was come to that the matter should be referred to arbitration, but in consequence of some misunderstanding the agreement was not carried

Mr. Digby Seymour, Q.C., on the part of the plaintiff, now moved for a rule calling upon the defendant to show cause why the case should not be restored to the paper, and an early day fixed for the trial; and why the defendant should not pay the costs of the day, which had been rendered useless by the record being withdrawn. The learned counsel said that the action was commenced at the end of 1866, and on October 16. 1868, Mr. Sclater-Booth wrote agreeing to terms of reference. A long correspondence followed, but no reference was brought about, and in January last the case again stood for trial. A day or two before the trial, counsel again agreed to a reference, "The reference to be on the footing of Mr. Sclater-Booth's letter of October 16, 1868, subject to the following change in section 4. The section to run thus:—Their lordships are willing to abide by the offer made to you and declined by you in 1867, namely, that you should bring before the arbitrators any substantial claims which you may desire to make on legal or moral grounds against the Crown, the arbitrators to have power in relation to any such claims to make a recommendation to the Government having regard to all the circumstances of the case. Stet processus of action without prejudice to any claims Mr. Edmunds may make against the Crown in consequence of the reports of Messrs. Greenwood and Hindmarch." A formal deed of submission to arbitration was thereupon drawn up, and it stated, "That any claims which the said Leonard Edmunds may make against her Majesty the Queen in consequence of the reports of the said Messrs. Greenwood and Hindmarch, and the said two papers, shall be referred to the award of the arbitrators, and they may make any recommendation to her Majesty the Queen in respect of the premises in this paragraph set forth." This deed, however, was not acceded to on behalf the defendant, his advisers wishing to state in it that the arbitrators might consider the plaintiff's claims in reference to the reports, "provided the arbitrators shall think fit to entertain them, and the plaintiff declining to accept any variation in the terms of reference." The matter still stood in this position, and the learned counsel said that the plaintiff, who always had been and still was anxious to have his case tried by a jury, had no alternative but to make the present motion.

The Lord Chief Justice suggested that the rule should be to show cause why an order of reference should not be drawn up embodying the terms of agreement for reference signed between counsel for plaintiff and defendant, or why the agreement should not be cancelled, and the cause restored to its place in the list, and appointed for the first sitting day after Trinity Term; and why the defendant should not pay the cost of the day. He apprehended that as soon as the matter came again into the hands of counsel they would have no difficulty in coming to an agreement.

A rule was granted in the terms suggested by his lordship.

# ROLLS COURT. April 21.

(Before the MASTER OF THE ROLLS.) DAW v. ELEY.

THIS was the hearing of a suit to restrain the de-This was the hearing of a suit to restrain the defendants, Messrs. Eley, from manufacturing or selling cartridge-cases for breech-loading firearms, in infringement of the plaintiff's (Mr. G. H. Daw, of Threadneedle-street) patent, for improvements in the manufacture of such articles, by making them of a metal tube, formed from a strip of thin rolled sheet-metal, bent into a tubular form, and

having its overlapping edges soldered or cemented together, so as to form a perfect tube.

Our readers will remember that, in consequence of the failure of what is known as the "Boxer Service Cartridge," the Secretary of State for War offered a prize of £400 for the 500 best cartridges, to be produced by a given day, upon certain conditions. The plaintiff, G. H. Daw, competed for the prize, and won it by means of his cartridge, the cases of which formed the subject of the patent which Messrs. Eley was alleged to have infringed, by making and selling a case of brass, lined with paper or thin pastoboard, made in accordance with what is known as Rochatte's patent, of which they are the proprietors. The case occupied nearly two days

Mr. Manisty, Q.C., Mr. Jossel, Q.C., Mr. Mac-rory, Q.C., and Mr. Russell Roberts appeared for the plaintiffs; Mr. Grove, Q.C., Mr. Southgate, Q.C., Mr. Theodore Asten, and Mr. Langley for the defendant.

After hearing Mr. Manisty, Q.C., in reply, His Lordship reserved judgment.

# Correspondence.

# AN HERCULEAN FEAT.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—"The intended revolutions of the engines of Sir.—"The intended revolutions of the engines of the Majesty's steamship 'Hercules' is put down at 65." This agrees nearly with the pitch of the screw, so as to attain a speed of vessel of 16.3 knots per hour without slip. It has been stated that the engines would develope six times their nominal power going at the intended revolutions. Now, as the nominal power is found by the formula

Area of cylinder × 7lb. × speed of piston 33,000,

33,000, it follows that the actual force on the piston per square inch should be six times the nominal measure of 42lb. Shade of Watt! what have we here! An engine, without any cap on the valve, working up to the full boiler pressure to the end of the stroke. Are we in our second childhood? Have we become so obtuse that this rubbish is thrust down our throats in this the nineteenth century? Thank our stars, no; for technical education is fully appreciated, and we are above such devices, which can only tend to mystify the uninitiated.—I am, Sir, yours, &c., April 20.

Detector.

# SHIPS OF WAR.

SIR,-In a letter which appeared in your last number, under the above heading, your correspondent asks "whether guns are to be trained in a revolving turret, on a broadside, in fixed central turrets, &c., etc., with Captain Scott's system, Armstrong, the Moncrieff gun carriage, or how?" and proceeds to urge the adoption of the twin screw mode of propulsion, or, as he says, "my twins," which he describes as being a better form than originally demonstrated by the late Mr. Rennie, C.E.

I am pleased to observe that Mr. Winton inclines to the belief that the twin screw system is well adapted to vessels of war of a large class, but he should bear in mind that this opinion was long since held and specially advocated by Captain T. E. Symonds, R.N., and the late Mr. Richard Roberts, number, under the above heading, your correspondent

should bear in mind that this opinion was long since held and specially advocated by Captain T. E. Symonds, R.N., and the late Mr. Richard Roberts, C.E.; likewise by Captain Selwyn, R.N., and the Messrs. Dudgeon. However, I do not propose to follow Mr. Winton in detail, on the peculiar form of the ship he has shown, as I cannot perceive any practical advantages over the ordinary form—unless his object is to reduce the stowing capacity—which is seldom in excess of that required.

As to the proposal for "conical fixed turrets to suit the Moncrieff system," however admirable that system may be for other special purposes, the turret would require to be open at the top, to enable the

system may be for other special purposes, the turret would require to be open at the top, to enable the gun to be brought up in position to bear on its adversary, and, therefore, unprotected from vertical first If such a vessel were ever sent to sea, and met with a foe, I am afraid she would receive different treatment to that which Mr. Winton appears to think; for apart from other casualties which are likely to occur in such a vessel, it is most probable that either a stink-part live shell, or other unwelcome missiles. occur in such a vessel, it is most probable that either a stink-pot, live shell, or other unwelcome missiles, would find its way direct into the turret, and thus speedily and effectually silence the gun, and most probably end the career of such a ship.—I am, Sir, yours, &c.

F. H. R.

ANOTHER telescopic planet has just been discovered by M. Luther, at the observatory of Bilk. It is the 10sth of the series of those existing between Mars and Jupiter, and resembles a star of the 11th magnitude. The 107th was discovered in December



### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d. yearly, or 10s. 10d. half-yearly, payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. B. Smiles, MECHANICS MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communi-cations unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

Advertisements are inserted in the MEGHANICS' MAGA-ZINE, at the rate of 6d, per line, or 5d, per line for 13 inser-sons, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate Special arrangements made for large advertise

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# Meetings for the Meek.

Tues.-Royal Institution.-Professor Grant on "Astro-

nomy," at 3 p.m.
The Institution of Civil Engineers.—Mr. William Shelford, M. Inst. C.E., on "The Outfall of the River Humber," at 8 p.m.

WED.—Civil and Mechanical Engineers' Society.—Mr.
Haughton, President, on "The Paying and the
Non-paying Weight Pulled by the Locomotive
in 1867, as Deduced from the Statistical Tables
of the Board of Trade," at 8 p.m.

THURS.—Royal Institution.—Professor Tyndall on "Light, at 3 p.m.

Fel.—Royal Institution.—Mr. R. H. Scott on "The Work of the Meteorological Office Past and Present," at 8 p.m.

SAT.—Royal Institution.—Annual Meeting, at 2 p m.
London Association of Foremen Engineers.—M
James Rae on "Iron Shipbuilding," at 8 p.m.

# Habal, Military, and Gunnery Items.

THE Emperor of Austria has conferred the Order of the Iron Crown of the third class on Dr. Petermann for his services rendered to science in his expedition to the North Pole, and the Cross of Chevalier of the Order of Francis Joseph on Captain Koldewey, the naval chief of the same.

A RUMOUR has reached us that the Government intends to continue the present Snider breech action with the Henry barrel in the military arm of the future. We do not youch for the truth of the report, but it comes to us from a quarter in which such say ings generally have some foundation.

The oldest of the Austrian generals, Baron de Lebzeltern, has just died at the age of 83. The distinguished veteran served in the campaigns of 1811 and 1813, and the Archduke Charles confided to him the military education of his sons. After sixty years of active service the baron became governor of the military school and president of the high military court of Austria. He was a personal friend of the Duke of Wellington.

His Majesty, the King of the Netherlands, has awarded the following rewards:—To Captain Dunn, master of the fishing smack "Criterion," a silver medal, certificate, and £6; J. Bains, pilot, a certificate and £3; P. Larsen, seaman, a certificate and cate and £3; P. Larsen, seaman, a certificate and £2 10s.; J. Rowen, seaman, a certificate and £2 10s.; A. Lorensen, boy, a certificate and £1. These persons were instrumental in saving the lives of the master and crew of the Dutch fishing vessel. Grietje." when that vessel was wrecked upon the Dogger bank, December 1, 1868.

bank, December 1, 1868.

The following vessels are now in course of construction for the Royal Navy:—The "Bittern," gun vessel, Pembroke; the "Briton," corvette, Sheerness; the "Bulwark," screw ship, Chatham; the "Hotspur," ram, Glasgow; the "Invincible," iron ship, Glasgow; the "Iron Duke," iron ship, Pembroke; the "Robust," screw ship, Devonport; the "Swiftsure," armour-plated ship, Jarrow; the "Tenedos," sloop, Devonport; the "Thalia," corvette, Woolwich; the "Triumph," iron ship, Jarrow; the "Vanguard," armour-plated ship, Birkenhead; and the "Vulture," gun vessel.

Anneren is a correct list of the French navy at

-Frigates 9, cor-241. 3. Paddle-wheel steamers.vettes 7, avisoes 35—total, 51. 4. Sailing ships.—Ships of the line 2, frigates 10, corvettes 6, brigs 5, brigantines 12, cutters 19, lorchas 7, peniches 7, great boats 7, transports 25—total, 100. Recapitulation.—Ironclads 63, screw-steamers 241, paddle-wheel steamers 51, sailing ships 100.—General total 455.

The quarterly meeting of the members of the Royal Naval Benevolent Society was held the other day at Willis's Rooms, King-street, St. James's, Admiral the Earl of Lauderdale in the chair. The report showed a balance from last quarter of £236 0s. 4d.; dividend and interest, £650 7s. 6d.; subscriptions and donations, £434 16s. 1d.; the expenses amounted to £713 15s. 11d., leaving a balance respecting the admission of assistant paymasters to respecting the admission of assistant paymasters to participation in the benefits of the society. It was ultimately decided that they should be admissible. The report was then adopted, and the proceedings closed in the usual manner.

A TRIP down the river to Erith was made on A TRIP down the river to Enth was made on Mednesday, in a steam launch just finished, by Messrs. Yarrow and Hedley, of Poplar. Her length is 35ft.; beam, 6½t.; engines, 5-horse power; speed, 8½ miles per hour. For navigation, one man and a boy is all the crew required, but the boat will carry sixteen or eighteen persons. On the voyage, the saloon steam launch under construction in the buildsaloon steam launch under construction in the outling yard at Poplar was visited. The length of this launch is 40ft.; engine power, 7 horses nominal; estimated speed, 9 miles an hour. These boats are well suited for river and canal navigation, and it is very possible that we may hear of them hereafter on the Nile or the African lakes.

Moses Dyer, who enlisted in the 2nd battalion MOSES DYER, Who enlisted in the 2m battain 30th Regiment, about the year 1801, died at Tetsworth, Oxfordshire, on Saturday, having served in Spain and Portugal, and received the war medal, with clasps for Badajoz, Cuidad Rodrigo, &c., also a medal for Waterloo, where he was severely wounded medal for Waterloo, where he was severely wounded in the ribs. He had completed his 86th year all but one month; a widow and children, and graudchildren survive him; the former being without any means of support, and having reached an advanced age, the benevolent may feel disposed to contribute even a trifle for her benefit. The eldest son of Mosse Dyer, was in the 86th Regiment in eleven engagements during the Indian mutiny, and from the effects of the campaign, suddenly dropped dead on board ship on the return passage to England. on the return passage to England.

A LETTER in the "Journal de Liege," dated from A LETTER in the "Journal de Liege," dated from Longwy, says:—" We hear much of the conveyance of troops, arms, and munitions of war by the Eastern Railway. I can speak as to the fortress of Longwy. The effective strength of the garrison has Longwy. The effective strength of the garrison has never been so small—only two companies of infantry and about a score each of artillery and cavalry. But, on the other hand, the magazines are crammed with on the other hand, the magazines are crammed with stores. The old stock of powder has been renewed, and nearly 6,000 kilogrammes of fresh powder have been received within a month, the old guns have been replaced by rifled cannon on the newest system, the loopholes for musketry, closed for many years, have been reopened, and the number of guns, which was five in each bastion, has been increased. Vast was not in each bastion, has been increased. Vast stores of freshly-made biscuit have been accumulated, and the works on the ramparts are being pushed on with the greatest activity. With Metz and the other frontier fortresses it is the same."

# Miscellanea.

A BILL to amend the law relating to Post-office A BILL to amend the law relating to Fost-onice Savings Banks proposes that the Postmaster-General may direct his officers to receive from any one depositor sums amounting in the whole to not more than £100 in any one year, and not more than £300 in any number of years.

THE partnership hitherto existing between Messrs. Wallis, Haslam and Steevens, agricultural engineers, of Basingstoke, has been dissolved on the retirement of Mr. Haslam from the firm, and the business will in future be carried on by Messrs. Wallis and Steevens. A valuation of the partnership property has been made by Mr. Robert C. May and Mr. T. C. Hambling, of Westminster.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending April 17, 1869. was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 12,407; Meyrick and other galleries, 2,526; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,292 Meyrick and other galleries, 193; total, 17,418. Average of corresponding week in former years, 11,233. Total from opening of Museum, 8,355,787.

Jarrow; the "Vanguard," armour-plated ship, Birkenhead; and the "Vulture," gun vessel.

Annexed is a correct list of the French navy at the present time:—1. Iron-clad fleet.—Ships of the line 2, frigates 19, corvettes 9, cruisers 7, floating batteries 26—total, 63. 2. Screw steamers.—Ships of the line 15, frigates 18, corvettes 21, avisoes 60, gun boats 70, transports 55, special ships 2—total, 28; Salford, Bradford, Hull, and The "Medical Times" states that there was a case

Dublin, 31; Edinburgh, 32; Newcastle-on-Tyne, 35; and Glasgow, 44.

The Lord President of the Council has requested The Lord President of the Council has requested Sir Charles Wheatstone, Sir Michael Costa, Professor Tyndall, Lieut. Colonel Scott, R.E., Captain Donnelly, R.E., and Mr. Bowley, to report on the acoustics of the new lecture theatre at South Kensington. There will be three trials, one by a lecture, with demonstrations, on musical pitch, by Professor Guthrie; a second by voices, directed by Mr. A. Sullivan; and the third by instruments, directed by Mr. Ella. Mr. Ella.

As August 27, 1870, will be the centenary birthday of the great German philospher Hegel, the Philosophical Society of Berlin have issued an appeal for subscriptions for a monument to the distinguished subscriptions for a monument to the distinguished thinker. Dr. Matzner has addressed himself to Dr. J. H. Stirling, Piershill, Edinburgh, the author of "The Secret of Hegel," to request his co-operation in the work of collecting the desired funds in Great Britain; and Dr. Stirling has announced in the "Edinburgh Courant" his willingness to receive and acknowledge any contributions sent him to be for-warded to Berlin.

THE number of hogs packed in the Western States THE number of hogs packed in the Western States in 1868-9 was 2,477,264, as compared with 2,781,084 in 1867-8; 2,490,791 in 1866-7; 1,705,855 in 1865-6; 2,429,779 in 1864-5; 3,261,105 in 1863-4; 4,069,520 in 1862-3; 2,895,666 in 1861-2; 2,155,702 in 1860-1; and 2,350,822 in 1859-60. The weight of the pork thus packed was computed at 512,174,332lb. in 1868-9 as compared with 561,399,432lb. in 1867-8. The as compared with 561,399,43216. In 1867-8. The 2,477,264 hogs packed in 1868-9 were contributed by the following States:—Ohio, 544,651; Illinios, 806,033; Indiana, 326,658; Kentucky, 183,426; Missouri, 361,067; Wisconsin, 129,094; and Iowa, 126.335

126,335.

The result of the final appeal on the long litigation between the North-Eastern Railway Company and Mr. George Hudson was to confirm the reversal of the decision of the Master of the Rolls, and reduces Mr. Hudson to a state of penury. He is now in France, said to be utterly destitute. In addition to a subscription to meet present wants, and in the belief that the "Railway King" was as much "sinned against as sinning," a large shareholder has intimated his intention to ask his co-partners in the North-Eastern Company to grant to Mr. Hudson an annuity of £200 a year. An interesting discussion is looked for at the next general meeting, and many believe the feeling will be in favour of the project.

In the nine months ending March, 1869, the revenue of the Clyde Trust amounted to £106,105, as compared with £101,935 in the corresponding period of 1867-8, showing an increase of £4.170. For the whole of the financial year 1868 the revenue of the Trust was £143,840, as compared with £97,983 in 1860. £64,243 in 1850, 46,536, in 1840, £20,296 in 1830, and £6,328 in 1820. The Customs are constant and the financial years £1,167.53 £97,983 in 1860. £64,243 in 1850, 46,536, in 1840,  $\pm$ 20,296 in 1830, and £6,328 in 1820. The Customs revenue collected at Glasgow in 1868 was £1,106,753 as compared with £883,981 in 1860, £645,669 in 1850, £472,563 in 1840 £72,053 in 1830, and £11,428 in 1820. The population of Glasgow in 1868 was estimated at 515,412, as compared with 395,251, in 1860, 333,657 in 1850, 270,486 in 1840, 202,426 in 1820, and  $\pm$ 147,043 in 1850. 1830, and 147,043 in 1820.

RECENT communications from Adelaide, South Australia, have made known the discovery in the Southern portion of the colony of a remarkable carboniferous substance, which hitherto has only been found in small quantity in the coal strata of Derbyshire. It is a "mineral caoutchouc," so called from its general appearance and some elasticity. In Australia it is found on the surface of the sandy soil, through which it would appear to exude from beneath, as, burnt off occasionally by the bush fires, it is again found after the winter season occurring in quantity and of various thick, nesses. Analysis proves it to contain 8-2, or more per cent. of a pure hydro-carboniferous oil; its RECENT communications from Adelaide, nesses. Adatysis proves it to contain 5.2, or hade per cent. of a pure hydro-carboniferous oil; its value for gas-producing purposes would therefore be great, and it is also believed to be applicable to the manufacture of certain dves.

manufacture of certain dyes.

From a description given by the "Alta California' of the works adopted by the Central Pacific Railway to protect the line from the heavy falls of snow to be expected in certain sections, it appears that a shed covering has been erected 22 miles in length. This shed is 16ft. in width and 16ft. in height, not including the pitch of the roof. It is put up in the most substantial manner, all the timbers used being of the best quality to be obtained. The sides are enclosed, and were it not for the fact that day light penetrates through the interstices between the boards, the whole would be like a huge tunnel. The building is braced together in a peculiar manner, and is, in addition, firmly bolted to the rocks near the face of a cliff, Where snow slides are to be feared, an extension of the roof has been carried to the cliffs, so that falling masses shall pass over the



of compound fracture so offensive that it defied the effects of ventilation and the usual disinfectants. The wound was covered with dry earth, the odour The wound was covered with dry earth, the odour was absorbed, and with the abatement of this came a speedy improvement in the character of the wound. Encouraged by this result, Dr. Hewson has applied it with marked success in the treatment of every other disease attended with profuse and offensive suppuration—ulcers of the legs, contused and sloughter wounds guarded twenty several burns capacity. ing wounds, gunshot wounds, severe burns, cancer. In all these it is said to have succeeded beyond expectation, and it is now proposed to apply it to smallpox, the most offensive and virulent of all

An important discovery of old Scottish coins was recently made in a field near Prestonpans. There were in all 114 coins, chiefly silver, dating from the reign of James III. to that of Mary. The coins were lying in a heap, as if they had been originally in a bag. Among them was a gold noble of the time of Mary. One of the silver pieces had been struck in commemoration of Mary's marriage with the Dauphin of France. It is dated 1558, and in the Dauphin of France. It is dated 1558; and in addition to the monogram, "F.M.," with the heraldic emblems of France and Scotland, there is heraldic emblems of France and Scotland, there is the following Latin legend on the reverse—"Jam non sunt due sed una caro." One of the silver coins, bearing the date 1558, is said to be almost as perfect in its stamping as on the day when it left the Scottish mint. A number of the coins have been deposited in the Edinburgh Antiquarian Museum. Carberry-hill, the scene of Mary's surrender, which is in the neighbourhood of the place where the discovery was made. covery was made.

THE buffaloes found in the telegraph poles of the overland line a new source of delight on the treeless prairie—the novelty of having something to scratch prairie—the novelty of having something to scratch against. But, observes an American paper, it was expensive scratching for the telegraph company, and there, indeed, was the rub, for the bisons shook down miles of wire daily. A bright idea struck somebody to send to St. Louis and Chicago for all the bradawls that could be purchased, and these were driven into the poles with a view to wound the were driven into the poles with a view to wound the animals and check their rubbing propensity. Never was a greater mistake. The buffaloes were delighted. For the first time they came to the scratch sure of a sensation in their thick hides that thrilled them from horn to tail. They would go 15 miles to find a bradawl. They fought battles around the poles containing them, and the victor would proudly climb the mountainous heap of rump and lump of the fallen, and scratch himself into bliss until the bradawl broke or pole came down. There has been no demand for bradawls from the Kansas region since the first invoice. since the first invoice.

# Matents for Inbentions.

# ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

Ment:—
BOILERS AND FURNACES—3059, 3084
BUILDINGS AND BUILDING MATERIALS—3080, 3089, 3097, 3099, 3105, 3108
CHEMISTRY AND PHOTOGRAPHY—3096, 3098
CULTIVATION OF THE SOIL. including agricultural implements and machines.—3087
ELECTRICAL APPARATUS—3051, 3060
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—3055, 3058, 3061, 3062, 3063, 3032, 2095
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—3052, 3031, 3086, 3110
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments. &c.—3042, 3064, 3065, 3066, 3070, 3075, 3076, 3090, 3092, 3096, 3109
GENERAL MACHINERY—3040, 3045, 3048, 3049, 3056, 3057, 3079, 3088, 3094
LIGHTING, HEATING, AND VENTILATING—3043, 3054, 3067, 3007, 3101

METALS, including apparatus for their manufacture

3050
MINCELLANEOUS—3046, 3047, 3053, 3069, 3071, 3072, 3078, 3085, 3104, 3106, 3107
BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—3041
SHIFS AND BOATS, including their fittings—3083, 3091, 3100
STEAM ENGINES—3084
WARFARE—3068, 3074

3040 E. T. Bellhouse and W. J. Dorning, Manchester.

Hydraulic presses. Dated October 6, 1868.

In presses constructed according to this invention, three rams, with their respective cylinders, are employed in one arrangement. The rams and cylinders are ranged in line one with the others, the two outer rams and cylinders being of a length suitable to the entire lift of the press table. The centre cylinder is made suitable for a ram of a greater diameter than the two outer rams,

the stroke of which is considerably less than that of the outer rams. The central cylinder is cast in one portion with the lower cross piece of the press, or, if found more convenient, the cylinder may be separately formed, as in the case of the outer cylinders. When the compression of the cotton or other material is commenced, the two outer rams are forced up by the pumpr, the central ram remaining stationary. The action of the outer rams continues until a greater pressure than the said outer rams can communicate is required. An intermediate piece is then placed between the upper part of the central ram and the lower part of the central ram and the lower part of the press table or follower, and the three rams are forced up simultaneously to produce the final compression. The intermediate piece is preferably formed of metal, and of a form similar to an ordinary press ram, and is suspended from a crane awivelling around one of the press columns, or from a carriage running on rails. In place of the arrangement just described, three or more rams, each having the full stroke or lift of the press table, may be employed, in conjunction with a ram of a larger diameter, having a short stroke, fitted or provided with an intermediate piece may be employed, in conjunction with other means, for effecting the first portion of the compression.—Patent completed.

3041 E. Simons, Sheffield. Railway brakes. Dated the stroke of which is considerably less than that of the

3041 E. SIMONS, Sheffield. Railway brakes. Dated

3041 E. Simons, Sheffield. Railway brakes. Dated October 6, 1868.

The patentee proposes to mount or otherwise support upon a bracket, or in a box, conveniently placed in the carriage, van, or vehicle, a catch, and a circular or segmental catch or indented plate, to which plate, or to its boss, a chain dependent therefrom is secured, capable, when the circular plate is partially turned, of winding up or folding the chain upon its boss or drum. To the lower end of the chain a rod is suspended transversely, to which are secured (immediately over the rails or metals) shoes or curved brake blocks. Two surfaces of these shoes when lowered fit the periphery of the wheel and the plane of the metals, so as to drag upon and prevent the revolution of the wheels. A flange is provided in order to keep the shoes or blocks in their position on the metals. The transverse rod and blocks or shoes are governed in their movements by means of curved slots, formed concentrically or parallel to the periphery of the wheels, in brackets, secured to the sides of the carriage, or to the axle or axle hox, and in such a position that when the catch wheel is slightly turned or wound up, so as to be caught and retained by the lever catch, the shoes or blocks, through the medium of the chain, are elevated or raised from the metals or rails. The concentric groove governs the position of the rod and blocks, clears them out of contact with the wheels, but when lowered the blocks are brought to bear upon the rail, so as to form an abutment for the wheels abut when lowered the blocks are brought to bear upon the rail, so as to form an abutment for the wheels.

3042 N. TCHEPELEVSKY, Moscow. Enamel. (A communication.) Dated October 6, 1868.

The enamel consists of two separate solutions, first, a warm solution of animal size, with the addition of glycerine and white alum. Second, a chemical production invented in Russia and known there as "Rumstedts Verdine," consisting of a mixture of sulphate of potash and sulphate of chromium, dissolved in cold water—Patent abandoned.

and sulphate of chromium, dissolved in cold water.—Patent abandoned.

3043 J. R. Wigham, Monkston, Ireland. Illuminating lighthouses. Dated October 6, 1868.

This relates to patents dated respectively April 4, 1865 (No. 945), and November 6, 1866 (No. 2871). It consists in illuminating lighthouses by means of combustible gases, prepared from coal, coke. or other similar carbonaceous substances, in a more or less pulverized state, and mixed with paraffin, petroleum, or shale oil, or other liquid or semi-liquid hydrocarbons, and also from peat, saw dust, and other similar vegetable matters, either alone or mixed with oil, paraffin, shale oil, petroleum, or other liquid or semi-liquid hydrocarbons. It also consists in an improved apparatus for the manufacture of illuminating gas, for the use of lighthouses, or for other purposes. The retorts, for the destructive distillation of the coal or other gasmaking material, are arranged in a horizontal position, each retort being somewhat arch-shaped, having in its interior surface near the spring of the arch a projecting fillet, in order to support a movable arched cast or wrought iron lining or partition, so constructed in one, two, or more pieces, that when placed in their proper positions they will have the effect of causing the greater part, if not all, of the gas distilled from the coal or other gasmaking material to pass under and over them.—Patent completed.

3045 F. S. GILBERT and W. G. WHITE. Laurence Pountney-lane, E.C. Self-adjusting spanners. Dated Oc-tober 6, 1868. These spanners are made of two bare of the

tober 6, 1868.

These spanners are made of two bars of iron, or any other suitable material, one longer than the other, with a jaw at the top of each bar. The shorter bar is placed in front of the longer one, so that the front bar jaw comes below the back bar jaw. The front part of the back bar is made with a male dovetail, and the back part of the front bar with a female dovetail, to correspond, for the front bar to slide on. At the bottom of the front back bars a lever, made to any convenient angle, is attached by means of joints.—Patent abandoned.

3046 A. G. STRAKER, Leadenhall-street, E.C. Samplebag for post. Dated October 6, 1863

An envelope or bag open at end or side with a flap, having two, three, or more lappets, is made or formed out of paper, linen, canvas, or any other material, all being gummed in either one or more operations. The under side of the flap is gummed or cemented.—Patent abandoned.

3047 B. RAMSEY, Wimpole-street, W. Knee caps for horses. Dated October 6, 1868.

This consists in forming knee caps for horses of soft vulcanized india-rubber, moulded or shaped to casts of those parts of a horse's leg to which they are intended to be applied. The knee caps are made of one entire piece of material, which is passed over the horse's foot to the desired part of his leg, which it surrounds and embraces, holding it securely in position, partly by its elasticity and partly by its shape, and allowing freedom of movement to the leg.—Patent completed.

3048 T. GARNETT, Smethwick. Hydraulic rams. Dated betober 6, 1868.

An induction and exhaust valve are formed both of

which are contained in the piston. The lifts of these valves are regulated by the seats. The seats of the escape valve and the induction valve are formed in the piston, each valve having two faces, one on the seat and the other off, thus closing the passage to one side of the piston and opening it to the other. The pressure is admitted by a pipe communicating with the induction valve, such pressure being prevented from escaping into the cylinder by means of packings. As soon as the pressure is admitted, the induction valve closes the passage to one end of the piston, thus opening the passage at the other end; the pressure being on one end of the pressure to the cylinder, until the spindle of the induction valve comes in contact with a regulating pin, and opens the passage to the opposite end of the piston; the pressure closing the exhaust at that end, and opening it at the other, allowing the exhaust at that end, and opening it at the other, allowing the exhaust to escape into an exhaust passage, which is formed through the length of the double piston rods, and connected with the exhaust valve. A reciprocating motion is thus obtained, or a series of strokes, given by the piston from side to side, or upwards and downwards, as may be required.—Patent completed. The lifts of these which are contained in the piston. The lifts o

and downwards, as may be required.—Patent completed.

3049 H. STEFFANSON, Gefieborgs Lan, Sweden. Sawing

secod. Dated October 6, 1868.

The object is to equalize the motion of saw frames by
checking or counteracting the momentum of the frame,
and using the power thus acquired to drive the frame in
the opposite direction. The invention consists in providing an elastic cushion to receive the shock of the crosshead of the reciprocating saw frame at each end of the
stroke. This elastic cushion may be formed either of a
body of air, steam, or gas contained in a cylinder or
cylinders, or india-rubber or metallic springs may be
employed instead.—Patent abandoned.

employed instead.—Patent abandoned.

3050 J. G. WILLANS, St. Stephen's-crescent. Manufacture of iron and steel. Dated October 6, 1868.

The first improvement is to supply chemical salts or other solution, not for the purpose of depriving the metal of carbon, but of such a nature as to combine with or neutralize the sulphur or phosphorus in the metal, so that in melting or manufacturing the injurious effects of these elements may be removed or lessened. The second improvement is to remove the greater part of the cinder from the granules after they are brought into the malleable condition, and before they are hammered or compressed together, and then to compress the granules or particles into moulds or shapes to produce articles of iron, or it may be of steel, possessing greater strength than if made of cast iron. The third improvement is, first, to heat the granules and oxide together in one place, removing them thence before the granules are molten, and then melting them with cast iron, charcoal, or other materials commonly used by steel melters.—Patent completed.

3051 J. ASPINALL, Harrow. Telegraphic cables. Dated

3051 J. ASPINALL, Harrow. Telegraphic cables. Dated

3051 J. ASPINALL, Harrow. Telegraphic Cocces.

October 6, 1868.

Telegraphic ropes or cables are formed of hair or animal fibre. Or, where hemp or vegetable fibre is used, then, in order to protect the telegraphic or other rope or cable, the rope or cable is enveloped in felt or other fabric made of animal fibre. The felt or fabric is preferably saturated with a compound of gutta-percha and pitch or resin, which causes it to adhere firmly to the rope or cable. Silica or other similar hard powder is usually mixed with the gutta-percha and pitch, or similar composition, or a silicate, such as soapstone (silicate of magnesia).—Patent abandoned.

Patent abandoned.

3052 J. JEFFERYS, Upper Norwood. Preserving meat Dated October 6, 1868.

This refers to a patent, dated July 29, 1863 (No. 2384). The meat or other substance is frozen in flat boxes, say, a yard square, and 5in. to 10in. deep. The freezing surfaces are of sheet iron; the narrow sides are of deal board, for non-conduction. To preserve the flavour of the meat, and keep it from being bruised, it is surrounded by seasoned soup, made of all the available parts of the slaughtered animals not packed as meat. The blood is also utilized by being mixed with slaked lime and sulphate of lime for cement, for rendering the boxes soup-tight, and even airtight.—Patent completed.

2053 C. EXEMET. Kingston-upon-Hull. Extraction oils.

3053 C. ESKRETT, Kingston-upon-Hull. Extracting oils. Dated October 6, 1868.

A piece of iron, copper, or other material of the proper length and breadth is used, suitable to the size, shape, and length and breadth is used, suitable to the size, shape, and plain, corrugated, or chequered, as may be required. A projection is cast or otherwise fixed on the widest end of the plate, rising up nearly the thickness of the cake, rounding it on the top and back, and hollowing it at the bottom, towards the plate.—Patent abandoned.

3054 F. P. WARREN, Lee. Cooking apparatus. Dated October 7, 1868.

This consists in a novel combination and arrangement of boilers of peculiar form, with ovens and steam cooking or drying closets, the whole arranged so as to be heated by the products of combustion from one freplace, which is itself mainly formed by the boilers themselves, thus preventing the waste of heat and loss of time which occur in cases where other parts, such as cast-fron cheeks, are used to form the fireplace.—Patent completed.

to form the fireplace.—Patent completed.

3055 J. H. JOHNSON, Lincoln's Inn. Blankets for printing presses. (A communication). Dated October 7, 1863.

This consists in a novel textile fabric which will be found useful as a substitute for the ordinary blankets employed in printing presses. In manufacturing the improved fabric or blanket, to which the name of the. "Delegue blanket" is given, awarp of silk, spun, floss silk or cotton is used, worked by a satin twell mount, as is well understood by weavers; combined with this warp there is a woollen weft also operated as for satin fabrics. The fabric thus produced is to be coated on the satin warp side or face with a solution of caoutchouc, so that the fabric presents a perfectly smooth and pliable surface on one side. The other face remains without any finish whatever, presenting the appearance of a fabric composed entirely of wool.—Patent completed.

2056 D. MARSHALL, Leith, N. B. Packing for machinery.
Dated October 7, 1868.
This consists essentially in an improved packing to be used in making the joints of tubes in surface condensers water and steam-tight, and which may also be used for other similar purposes. The improved packing consists of a ring or tube of india-rubber or similar elastic material, having an annular groove or space formed at one end,



between the outer and inner periphery of the ring or tube, so as to form a kind of cupped ring, the edges of which will spread out under pressure and form a water and steam-tight joint.—Patent completed.

3057 W. Sievwright and G. Worral, Dundee, N.B. Pressure apparatus. Dated October 7, 1868.

This consists in the arrangement and construction of levers in which the pressure is produced by means of a weight, and rendered elastic by the introduction of a metal spring in contradistinction to levers in which the pressure is produced by means of a weight only, or by means of a compressed spring.—Patent abandoned.

means of a compressed spring.—Patent abandoned.

3058 J. H. Johnson, Lincoln's Inn. Spinning sotton.
(A communication). Dated October 7, 1863.

This relates, first, to the flyers for fly frames, or any frames where the flyers are removed for doffing, and consists in providing a curved tube or passage for the roving through the upper part of the flyer distinct from the socket by which the flyer is fitted on to the upper end of the spindle. Second, to centrifugal pressers for presser flyers, and the object is to afford facility for readily removing and replacing the presser arm when requisity for this purpose it is proposed to connect the arm of the flyer and the detachable presser by a spiral guide and worm situate either at the lower or upper portion of the flyer arm, so that when turning one way the presser tends to detach itself from the flyer, and when turning in the opposite direction it stops by the fact of the pressure arm itself coming in contact with the end of the flyer arm.—Patent completed.

3059 B. T. Monteith, Dinaid, France. Firebricks and

3059 R. T. Monteith, Dinaid, France. Firebricks and cement. Dated October 7, 1868.

This consists in composing the bricks and cement of a mixture of fireclay and oil still cake, a substance composed principally, if not entirely, of carbon.—Patent abandoned.

abandoned.

3060 E. T. Hughes, Chancery-lane. Generating electricity.
(A communication). Dated October 7, 1868.

This consists in the application of the substance called "galina" or "alquifore" (i.e., sulphuret of lead free from either silver or copper), to the production of electricity by heat, and one of the chief characteristics of the invention is the combination of this substance with iron to form a chemical pile, the said combination being effected by solder, preferably composed of alquifore mixed with about 10 per cent. of sulphuret of copper.—Patent completed.

2061 W. Rossiter. Accrington. Warping machines.

solder, preferably composed of alquilore mixed with about 10 per cent. of sulphuret of copper.—Patent completed.

3061 W. Rosster, Accrington. Warping machines. Dated October 7, 1868.

This consists, first, in the employment of wires stretched across the machine in contact with the levers, which are supported by the warp threads for the purpose of enabling the fluke to be continuously cleared away. Second, in the employment of vertical rods fixed a short distance from the frame sides for the ends or pivots of falling rods and rollers to work between, and in the wedges and levers for raising the front roller when required, and the slidding thats and hooks, and also in the levers worked by tappets on the stopping and setting on rods for holding up the falling rods after they have been raised. Third, in the form and application of the front end of the eccentric rod for working the oscillating shaft and pulling the spring handle out of its detent for causing the stoppage of the machine. Fourth, in the spring buffer in connection with the double catch wheel, and the arms or hinges at one or both ends of the helical spring for the purposes described. And, fifth, in an improved arrangement of mechanism for enabling the drum and warp beam to be turned in forward and backward directions with only one driving strap.—Patent completed.

driving strap.—Patent completed.

3062 J. WOOD and J. ARUNDALE, Hollingworth. Shuttles.

Dated October 7, 1868.

This consists in disposing the loose end of the tongue spring in a groove formed in the upper surface of the head or tumbler in the direction of its length, such groove either terminating in a hole bored through the remaining portion of the head or tumbler, or cut right through to the back. The extremity of the loose end of the spring is bent so as to enter the hole, and is thereby held in position, or, in the absence of the hole, a metallic strap or staple is affixed across the groove for the same purpose.—Patent abandoned.

W. E. NEWTON, Chancery-lane. Knitting machinery.

scross the groove for the same purpose.—Patent abandoned.

3063 W. E. Newton, Chancery-lane. Kaitting machinery. Dated October 7, 1868.

This relates to that class of knitting machinery wherein rectilinear reciprocating latch needles are arranged in a row, parallel to each other, and operated by means of a cam. The chief object is to arrange a bar in front of, and slightly above the plane of the needles, so that while the hooked ends of the needles pass beneath, the bar will operate as a latch holder, to prevent the latches (when thrown back) from falling on top of the hooked points of the needles, when the needles advance to receive the yarn from a yarn distributor. The bar is also arranged that it will serve as a support for the outer end of the yarn carrier, and so as to keep the yarn distributor always at a given height over the needles, as they advance to receive the yarn. Another object is to connect a latch holding bar with a movable work holder, so that when the hinged frame of the former is turned over out of working position, it will move the work holder a sufficient distance away from the jack bar to allow free access to and an inspection of the work upon the needles. Another object of the invention is to apply a fine wire in a groove made in the needle bed, just in rear of and parallel to the jacks, so that such wire shall serve as a means for shutting the latches, when the needles are drawn fully back, also as a means for opening the latches when the needles are moved forward to a working position, and also as a means for holding back the needles, and preventing them from being casually thrown forward, when it is desired to keep any number of needles out of working position.—Patent completed.

3064 J. WATSON, Newington-causeway. Wall papers.
Dated October 7, 1868, No. 3066. A block is then prepared with a raised surface, corresponding exactly with the raised patern to be produced. caving all the required lines and indentations thereon, or nails, or stude, or strips of metal are placed on the surfac

It is embossed or depressed in that position, and in this manner the raised portions from the face of the paper are formed. The carved block is dipped into a sieve of oil colour or other suitable adhesive substance not soluble in paste or water, and having adjusted the same immediately at the back of the pattern on the paper, by means of guide pins, or by other means, pressure is applied thereto by means of the ordinary "dolly" or in any other convenient manner.—Patent completed.

8065 J. Dupill, Whitechapel-road. Steres. Dated

October 7, 1868.

This relates to lace bottoms for sieves or screens. A moderately thin wire is placed above and below the longitudinal wires, and as each of the latter is inserted, the two former are twisted together, so that they are twisted or crossed between each wire, and beat or force up another longitudinal wire after each twist, so that as the top and bottom wires are twisted together between every two longitudinal wires, the latter are held perfectly firm and cannot get out of place.—Patent abandoned.

and cannot get out of place.—Patent abandoned.

3066 J. WATSON. Newington-causeway. Wall papers.
Dated October 7, 1869.
The ordinary roller or cylinder printing machine is employed, and the desired pattern printed upon the paper in water gold size. The paper is then conducted by rollers beneath a box or hopper, with a narrow aperture containing the gold, silver, or bronze powder, which distributes the same over the surface of the paper on which the pattern has been printed, immediately after which the paper passes over a revolving beater which strikes against the back of the paper, and throws off the superfluous metallic dust or powder which may be from time to time returned to the hopper and used over again. The paper may then pass between two "flatting" rollers, or may be dried and rolled at once.—Patent completed.

3067 W. ESTOR, Hampstead, and C. T. Pearcs, Maddox-

at once.—Patent completed.

3067 W. ESTOR, Hampstead, and C. T. PEARCE, Maddoxstreet, W. Disinfecting. Dated October 7, 1868.

This consists in a cup or vase of any convenient size, externally coated with finely divided charcoal (mixed with
adhesive substances, such as gum, starch, or gelatine), and
powdered or liquid sulphur which is dried in a hot room.

The interior of the cup is partly filled with chloride of
lime, from which sulphurous acid gas and chlorine are
liberated, filling the apartment, and thereby destroying all
infection, animalculæ, vegetable, and animal spores, and
leaving the atmosphere pure.—Patent completed.

3068 WESTLEY RICHARDS. Birminpham. Cartridox:

3068 WESTLEY RICHARDS, Birmingham. Cartridge Dated October 7, 1868.

3063 WESTLEY RICHARDS, Birmingham. Cartridge. Dated October 7, 1863.

A tube or capsule (by preference of brass) is employed, closed at one end, with the exception of a central hole of a size to allow the case for the fulminate to pass through. Or the case for the fulminate may be made in one piece with the tube or capsule. Within the capsule a lining cup is applied, formed so as not only to line the outer angle around the base of the capsule, but also to line the inner angle around the hat, cap, or percussion case, and this is done by forming the cup with a hollow projection raised up in its centre, so that when the cup is placed in the capsule, it covers over the hat, cap, or percussion case. The cup is pressed down into the capsule, until around the centre it rests solidly on its closed end or base. There is a perforation in the projection of the cup for the fire to pass from the fulminate to the charge. The upper end of the capsule where it receives the ball, the patentee frequently makes of a reduced diameter, and then the gum is made to correspond with the cartridge chamber larger in diameter than the bore.—Patent completed.

3069 R. H. BENTHAM, Bedford-row, W.O. Draughtman's

in diameter than the bore.—Patent completed.

3069 R. H. BENTHAM, Bedford-row, W.C. Draughtman's instrument. Dated October 7, 1868.

This consists in a flat ruler, similar to the well known rolling, perallel ruler, but instead of two wheels of the same size, one is made of greater diameter than the other, proportioned according to the requirements and made movable along the axie common to both wheels, and retained at any required distance from the other wheel. The nearer the wheels approach each other, the nearer will be the centre to which the lines will radiate.—Patent abandoned.

3070 H. JOSEPHI, Manchester. Watches and clocks. Dated

October 8, 1868.

The object is to prevent breakage when winding. A hollow barrel arbor is used, through or into which the winding square passes. The hollow arbor carries a ratchet wheel, provided with a cleck, and above this the winding square carries another ratchet wheel provided with a cleck. These ratchets are toothed in opposite or reverse directions.—Patent abandoned.

2021 G. Sprague Glocks and Markets and Markets

3071 G. Speight, Clerkenwell. Applying adhesive agents.

Dated October 8, 1868

Dated October 8, 1868.

In a framework, a trough slotted at bottom is mounted. In this trough a loose lining of muslin or other reticulated open meshed or porous flexible fabric is placed, which forms a sort of longitudinal bag or channel, and projects downward through the slot. The starch, gum, or other adhesive agent employed is introduced into the trough, and passes through the muslin or other fabric, and through the slot in the trough on to the material fed in continuous lengths or otherwise below the trough,—Patent abandand.

3072 J. CHAUDION, Brussels. Boring. Dated October 8,

1868
This relates to a previous patent, dated July 1, 1867
(No. 1916). It consists in the application of the system, apparatus, and tools described in the specification of the said letters patent to the boring or sinking of shafts and pits for mines and other purposes through aqueous strata, whereby the necessity of pumping the water out of such pits or shafts during the progress of the work is obviated. The apparatus employed is so arranged as to effect the complete isolation of the aqueous strata, thus enabling the work to be carried on through any depth of such strata more conveniently than heretofore.—Patent completed.

3074 J. MGRAY. Birkenhead. Working war turrets.

more conveniently than heretofore.—Patent completed.

3074 J. M'GRAY. Birkenhead. Working war turrets.
Dated October 8, 1868.

Revolving war turrets are worked by steam power machinery under the direct control of and operated by the person who is pointing the guns. According to one mode of working, this person is stationed in the turret and moves with it. According to another mode, the person who is directing the motion of the turret, and pointing the guns, is stationed at a look-out place at some distance from the turret and from the station. He operates an engine, which revolves the turret, and at the same time he points the guns by alming with a sight which is maintained in a direction at all times parallel with the guns in the turret.—Patent completed.

2075 E J. HUGHES, Manchester. Games. (A communication). Dated October 8, 1868.

This consists, first, in the adaptation to any ordinary billiard or bagatelle table, or to a table made for the purpose, of bells or gongs, combined with hoops and stalls for the purpose of playing with balls and cuce an improved game, which is called "croquet billiards." The stalls are held together at the top by a piece of wood, to which several gong bells are connected, and the remaining stalls are numbered as desired. Second, in the arrangement of a table mounted with pins or skittles in mittation of the American skittle alley, the pins on the table being struck by balls impelled by cucs. The table is formed with the proper gutters at each side and a proper track in the centre, and at the far end there is a trough or recess for the pins or skittles to fall into. Third, in an improved arrangement of folding table, to be used either for billiards, croquet billiards, skittles, or as an ordinary table. The portion of the table supported on legs or stands is the part intended for billiards, and to the ends of this part are hinged flaps.—Patent abandoned.

3077 F. AYCROURN, Southampton-street, Strand. Lead

hinged flaps.—Patent abandoned.

3077 F. AYCKBOUEN, Southampton-street, Strand. Lead pencils. Dated October 8, 1868.

The outer circumference of lead pencils is reduced within about \(\frac{1}{2}\) in in length of the end not intended to be cut, by filing or paring the same down to the extent of about 1-16th of an inch in depth. A coating of india-rubber, varnish, glue, or other cement, is then laid on the part that has been reduced, after which a suitable length of small bored india-rubber hose or tubing—vulcanized or not—is taken and drawn over the part which has been cemented, trimming off the edges with a wetted knife or scissors, when it forms an effective eraser.—Patent abandoned.

3078 E. PREVOST. 136, Euston-road. Controlling horses.

3078 E. PREVOST. 136, Euston-road. Controlling horses. Dated October 8, 1868.

This consists in the application of electricity, generated either by permanent magnets or by a galvanic battery, as found most convenient. In carrying out this invention, it is preferred to employ any suitable small and powerful magneto-electric machine, which may be situate convenient to the hand of the driver on a vehicle, as, for example, on or under the box seat. A wire or wires connect the magneto-electric machine or battery with the bit of the horse to be controlled, such wire or wires passing along or being enclosed or concealed within the reins.—

Patent abandoned.

as a sandoned.

3079 J. H. JOHNSON, Lincoln's-inn. Saw handles. (A communication). Dated October 8, 1868.

This consists of an ordinary saw blade, furnished with a slot, which, in form and size, corresponds to the form and size of a bolt, one end of which is provided with screw threads, to which a screw nut is fitted, which is placed in a recess made in the handle. The back end of the saw blade is fitted into a groove made in the front end of the handle. The part of the handle which is grasped by the hand of the operator is formed of wood, and is secured to the metal part by means of screws or rivets.

—Patent completed.

3080 W. SIMONS, Benfrew, N.B. Bricks. Dated Octob

1868.

This consists in making moulded bricks or blocks of a double dove-tailed form, the thinnest or narrowest part a double dove-tailed form, the thinnest or narrowest part of the brick or block being in the centre.—Patent abandoned.

3081 J. STEEL, Glasgow. Malt extract. Dated October 8,

1868.
This consists in arranging apparatus intended to contain the roasted malt in such a way that the worts may pass from the mash tun through it on their way to the boiler, and in constructing the extracting apparatus so that the worts may pass through the roasted malt in an upward direction, whilst the malt is kept stirred by revolving or other suitable agitators.—Patent completed.

2022 W. Reann. Kaichlaw. Looms. Dated Ootshar 8.

3082 W. BLAND, Keighley. Looms. Dated October 8,

1868.
This consists principally of a fluted iron roller, round and in contact with about three-quarters of the circumference of which the cloth is caused to pass. This roller is driven with a positive and constant motion by means of ratchets or otherwise, in the ordinary way, and has near one end a spurwheel gearing with a spur pinion on one end of a smaller iron roller placed above but not in contact with the fluted roller before named. The wheel and pinion are kept in gear by weighted levers bearing on the journals of the smaller iron roller.—Patent abandoned.

3083 G. DAVIES. Lincoln's Inn. Paper boats. (A com-

3083 G. DAVIES, Lincoln's Inn. Paper boats. (A communication.) Dated October 8, 1868.

This consists in attaching to the bottom and sides of such portions of the boat a series of longitudinal strips or pleces of paper or thin wood, or of prepared cloth of gradually decreasing width or length, and laid one over the other.—Patent abandoned.

the other.—Patont abandoned.

3084 J. Arnold, Sheffield. Steam botters. Dated October 8, 1868

This relates, first, to what are known as "upright" or vertical steam boilers. Second, to what are known as "Cornish" or horizontal flue boilers. It consists, principally, in inverting a hemispherical dish-shaped, conical, or other similarly shaped shallow auxiliary water space in the firebox, between the top of the latter and the upper side of the cross tube (or of the upper cross tubes, if more than one is used); and in connecting this auxiliary water space at the lower side to the cross tube by a short tube or ring, and at the upper side, with the water space above the top of the firebox, by means of two, four, or other convenient number of tubes, riveted, screwed, or otherwise fixed to the upper side of the auxiliary water space, and to the top of the firebox, so that there may be a free circulation of water between the water space, above the firebox, the auxiliary water space, and the cross tube—Fatent completed.

3085 R. Winder, Farningham. Boring holes. Detect

Patent completed.

3085 R. WINDER, Farningham. Boring holes. Dated October 8, 1868.

This consists of a frame resting upon wheels. Upon this frame is fixed a handle, to be worked by the attendant. The handle turns wheelwork or gearing attached to the frame, made of different diameters, to give power to the attendant. The wheelwork or gearing has a grooved or spiked pulley fixed to it, which is connected to other grooved or spiked pulleys by an endless chain strap, or rope. The pulleys being set in motion make the augurs or boring tools revolve, and dig out or bore the required holes. Weights are attached to the upper part of these augurs to press them into the ground. Long feathers or keys are fixed upon these augurs for nearly the length of



the round or square parts of the augurs-Patent abandoned

3086 J. DEWAR, Kircaldy, N.B. Food. Dated October 8.

3086 J. Dewar, Kircaldy, N.B. Food. Dated October 8, 1868.

The inventor takes, first, the entrails of recently slaughtered healthy animals, such as cattle, sheep, and pigs, and cleanses them, and then subjects them to careful desiccation, such as will expel the moisture, so far as practicable, without injuring the nutritive properties contained in the substances. For desiccation, he exposes the substances to a dry temperature of from 100 leg, to 212deg. Figh. Before desiccation it is advantageous to boil the entrails thoroughly, but this is not absolutely necessary. After the desiccation is complete, the substances are reduced to a meal or powder by any ordinary grinding apparatus. The entrails, cleansed as aforesaid, may be mineed, while raw (or boiled before or after being mineed) mixed with seeds, busks of grain, or other husks, or with bran, meal, or flour, and dried and used as food, in the form of cakes, a sufficient quantity of bran, meal, or flour is added to enable it to be kneaded and baked. Second, the inventor takes the entrails, cleansed as directed in the first method, and either with or without previous desiccation of the character therein described, and either before or after mineing them. He subjects them to the action of sulphurous acid, which he applies either in the form of aqueous solution of sulphurous acid of the ordinary commercial quality, say, of specific gravity 1-012, or in the form of a sulphito or bisulphite.—Patent completed.

3087 J. Dewar, Kircaldy, N.B. Making manure and decoloriting.

gravity 1012, or in the form of a sulphite or bisulphite.—Patent completed.

3037 J. Dewar, Kircaldy. N.B. Making manure and decolorizing. Dated October 8, 1868.

First, human or other animal excrements, the sewage of towns, or the blood of slaughtered animals, or vegetable matter or refuse, or other of the many animal and vegetable or other substances, suitable for manure, are mixed with soot or slag, and to this mixture a quantity of gas water is added. Second, soot or slag, or both of these substances, are mixed with gas water without mixing them further with the other substances before mentioned to such an extent as to thoroughly saturate the same. This combination forms a clean, convenient, and useful manure, which may be kept for any length of time. Third, blood and foecal and other animal, vegetable, and other matters suitable for manure, or any one or more of these substances, are mixed with the gas water, without soot or slag. This mixture affords a good manure, free from noxious effluvium, which will remain for a lone period of time in good preservation. According as the substances are more liquid or more solid, gas water is employed to the extent and in the manurer explained under the first head, omitting only the admixture of either soot or slag.—Patent completed.

3088 F. Gysel, Birmingham. Extending frames. Dated October 8, 1868.

This consists in the construction of a frame upon the

30-88 F. Gysel, Birmingham. Extending frames. Dated October 8, 1863.

This consists in the construction of a frame upon the principle of the apparatus known as "lazy tongs," which is mainly composed of a number of short pieces jointed together. To take a bedstead as an example, the expanding frame should be arranged with the series of jointed pieces to form the two ends of the bedstead, the ends being united by bars or rods, which support them and keep them parallel. The frame at one side or end is provided with guideways or slots at right angles, or nearly so, to the direction in which the said frame expands, and the end piece of each series of joints is provided with a stud or pin which works in the said guideway. Cords or bands should be also attached to the frame to support the mattress and other bedding.—Patent abandoned.

3080 T. HANCOCK, Drury-lane, W.C. Door knobs. Dated

3089 T. HANCOCK, Drury-lane, W.C. Door knobs. Dated

3089 T. HANCOCK, Drury-lane, W.C. Door knobs. Dated October 8, 1868.

This relates to improvements in door knobs or handles whereby they may be more securely attached to their spindles than heretofore, while greater simplicity in the fitting of the parts is also obtained. The square spindle on which the lock follower is mounted is screwed part of or throughout its length, and has a knob fixed at one end. In order to attach the knobs or handles to the door and spindle, a circular coilar is fixed over the lock aperture, through which and the door the screwed spindle is passed, and screw on the said collar or rose plate, so as to cover the collar. The knob is then screwed on at the opposite end of the spindle, tirst placing a rose plate loosely on the said knob as before, until a squared part of the knob abuts against the surface of the door, sufficient space being, however, left for the application of a back plate, which is provided with a transverse slot (slightly wider at one end, by preference) made at one side, by means of which it may be readily slid into position on the squared part of the knob.—Patent completed.

3090 M. P. Manfield, Northampton. Boot soles. Dated October 8, 1868.

This consists in attaching to the face of the sole or grain side of the leather a series of small, round, or other shaped

This consists in attaching to the face of the sole or grain side of the leather a series of small, round, or other shaped dises or studs of thick leather to take the tread and wear, and thus to protect the sole, and prevent its wearing down. These dises or studs of leather will add little to the weight of the boot or shoe, and will give it a quiet tread, while serving the purpose of the ordinary hob nails, which have the disadvantage of adding materially to the weight of the boot, and rendering it impossible to walk quietly upon bare floors or pavement in boots thus protected at the soles.—Patent completed.

protected at the soles.—Patent completed.

3091 W. E. NEWTON, Chancery-lane. Binnacle for iron ships. Dated October 8, 1863.

This consists in the construction of a binnacle for iron vessels, by means of which local attraction will be overcome without destroying the polarity of the needle. The invention consists in providing a receptacle around the compass in which the non conducting matter can be compressed to the requisite degree. The compass is pivoted within the ring, by means of the pivots, by which the ring is hung within a metallic cylinder. This cylinder is placed in an upright position in an outer larger metallic cylinder. The inner cylinder stands on legs, or is otherwise supported in the outer case, and the space between the two cylinders is filled with glass metallic oxides or other non-conducting material.—Patent abandoned, 2002 A. M-MILLAN, Mildmay Park. Button. Dated

other non-conducting material.—Parent abundanced.
2022 A. M-MILLAN, Mildmay Park. Buttons. Dated
October 8, 1868.

Metal buttons, such as are usually applied to trousers,
are stamped as heretofore from sheet metal, but in place
of forming four perforations in the centre of the button, a
single central perforation is formed. To attach such a
button to the garment, a stud or shank is employed, con-

sisting of a stem with a head at one end. The stud or shank is inserted through the fabric, so that its head remains at the back. The button is then placed upon the stem, which passes through the perforation as far as a shoulder, which, is preferred to form upon the stem, and then, by a suitable nipping tool or by other means, the end of the stem is elenched or expanded over the button, which thus becomes held.—Pattent completed.

the button, which thus becomes held.—Patent completed. 3094 II. A. BONNEVILLE, Parls. Pumps. (A communication). Dated vectober 9, 1868.

This consists, first, in a pump called orthodynamical, constructed in accordance with the principles of suction in the lifting pumps, usually known as chain pumps. Second, in the transformation of the chain pumps into portable exhausting pumps, by adapting them to a frame which may be readily carried, and working them either in a vertical or an inclined position. Third, the disposition of the pump, so that it may be able to lift water to any height which a unap barrel of a limited length should. Fourth, the construction of a chain which has the wedge gearing into the V-shaped throttle of a pulley or wheel. Fifth, the construction with any sort of chair, strap, rope, or cable of chains, straps, cables, or ropes, which permit the actuating of pulleys or wheels without sliding.—Patent completed. completed.

completed.

3095 J. Peel, J. F. Broadbent, and J.M. Baines, Bradford. Piclers. Dated October 9, 1868.

In the manufacture of the improved picker the following proportions of metals are used:—Copper, one-half; blook tin, one-fourth; and zinc. one-fourth. These are melted together and east in moulds of the required form. The picker is also provided with a tube or bush of glass, earthenware, or other similar material, through which the spindle of the shuttle box is passed. The picking strap is attached to a cross pin at the upper part of the picker, which pin is screwed or chased at one end, and, by the use of a nut, serves also for the purpose of securely holding the glass tube, above-mentioned, firmly in position.—Patent abandoned.

3096 W. JARONS, New Brighton. Poison labels. Dated

3096 W. Janons, New Brighton. Poison labels. Dated October 9, 1808.

A piece of flexible cardboard is taken and passed around the neck of the bottle. When in that position the sides are fastened by a stud or otherwise, and a conical cardboard projection or abield is then left, which very much resembles an ordinary shade fitted to a careel or other lamp.—Patent abandoned.

other lamp.—Patent abandoned.

3097 T. W. Dyer, Barnsbury-road. Anti-chimney smoker-Dated October 9, 1868.

The anti-chimney smoker consists of a fan or coil made of any metal, with a cap on the top, also made of any metal, working on a vertical spindle, attached to a cross bar, secured to the brickwork on either side by stay nails, with holes at the end of the said stay nails, to fix the cross bar in with screws.—Patent abandoned.

3098 H. DEACON, Appleton. Sulphuric acid. Dated

3008 H. Diacon, Appleton. Sulphuric acid. Dated October 9, 1898.

This consists in effecting the production of sulphuric acid by causing, first, a mixture of chlorine and sulphurous acid in a gaseous form together with the vapour of water, either at a low or at an elevated temperature, to commingle. Second, by causing chlorine and sulphuric acid, in a gaseous form, to pass into the lower portion of a tower or series of towers, filled with materials not acted upon by the elements employed, or by the products resulting, and allowing the gases to come in contact with a descending stream of water, either at a low or at an elevated temperature. Third, by causing chlorine in the gaseous form together with the vapour of water, to act either upon sulphur or upon metallic sulphurots, or mixtures of the same.—Patent abandoned.

3099 L. HANNART, N. A. AUBERTIN, and W. J. CUNNINGHAM, Oxford-street. Door plates, &c. Dated Octothin sheet of metal is taken, and the letters entirely

A thin sheet of metal is taken, and the letters entirely cut out by means of a saw or other cutting instrument, the plate being moved on a table in the direction of the shape of the letters, similar to fret work in wood carving. The plate so cut out is then fixed to a plain piece of metal or other material, either painted or coloured on one side, or a coloured substance may be placed between the two plates, or the letters may be filled with coloured wax, as commonly practised.—Patent abandoned.

commonly practised.—Patent abandoned.

3100 E. Evans, Neath, Wales. Propelling boats. Dated October 9, 1868.

This consists in causing the propellers of boats to act so as to prevent the washing of the banks of canals or other narrow water courses. It is proposed to effect this by forming the boat in two parts, leaving a space of two or three feet, more or less, between them and connected together by a false or auxiliary bottom of sheet metal or other suitable material. Between the two boats, one or more propellers are adjusted so as to be actuated by toothed gearing, set in motion by a steam engine or other prime mover. The propellers act upon the water passing between the two boats, and over the false bottom thereof, instead of acting upon the body of the water in the canal, as heretoforo.—Patent completed.

310 H. A. Achereau, Paris. Obtaining heat and light.

water in the canal, as heretoforo.—Patent completed, 3101 H. A. ACHEREAU, Paris. Obtaining heat and light. Dated October 9, 1868.

This consists in the application of flames produced by the combustion, atornear the point required, of solid, liquid, or gaseous inflammable matters in combination with suitable aids to combustion, by injecting the combustible matters under pressure, previously heated into the various liquid, liquicalable, pulverulent or viscous matters contained in suitable receivers, in order to heat or act chemically or mechanically on the said matters. The invention further consists in the application of the above mentioned flames for the manufacture of iron and steel, and to chemical operations for the production of light and vapours, and for treating gases and vapours.—Patent completed.

3103 W. J. CURTIS, Holloway. Sewing machines. Dated

3103 W. J. Curtis, Holloway. Seeing machines. Dated October 9, 1886.
This object is to produce a secure and fast stitch, with only one thread. To this end, a needle and thread are employed in the manner usually adopted in sewing machines, but underneath the work plate, a double-acting hook is mounted, and is rotated alternately in opposite directions. When the needle carrying the thread passes down through the work, the hook is rotated, say, to the lett, so as to cause its point to pass through the loop in the thread, and by continuing its rotation, say, for one complete turn, the thread is twisted, and a loop is formed through which the needle on its second descent passes and liberates the

thread from the hook, which will then be vibrated or turned in the opposite direction.—Patentabandoned.

surned in the opposite direction.—Patent abandoned.

3104 S. Traghheim, Swinton-street, W.C. Dissolving substances. Dated October 9, 1868.

This consists in a perforated disc supported upon feet or upon a rim. Between the under part of the disc and the bottom of the interior of the vessel to be heated, fans fitted to a shaft or shafts, revolving parallel with the plane of the perforated disc, are placed. The substance and liquids to be treated are to be placed upon the perforated disc, and the rotation of the fans will assist in keeping up a circulation of water.—Patent abandoned.

circulation of water.—Patent abandoned.

3105 J. C. Morgan, H. Macaulax, and F. W. Waide, Rotherham. Cast-iron cidens. Dated October 9, 1868.
This consists in custing cisterns and their lids with rounded or curved corners or edges instead of with angular corners or edges, as heretofore. The cisterns are thus enabled to be cast much lighter than heretofore, without any danger of their cracking. It is preferred that the corners should be rounded off to a curve of a radius of 1 in., but this may be greatly varied.—Patent completed.

of 1 in., but this may be greatly varied.—Patent completed.

3106 W. T. Read, Old Broad-street, E.C. Treating bottles.
Dated October 9, 1863.

This consists in the application of a preventative or preservative solution or fluid in the form of a fine spray diffused throughout the interior and upon the inside surface of the bottle. The atmosphere contained within the bottle may thus also be charged with the sulphurous acid or other gas evolved from the said solution or fluid. This is effected immediately before the bottle is filled with the beer or other liquid.—Patent completed.

3107 B. WALKER and T. F. A. PLAUK, Leeds. Reducing bull.log. Dated October 9, 1868.

A strong metal pan is employed, the internal form of which is, by preference, an inverted truncated cone. It is open at the bottom, and the sides are chequered or fluted. In or near the centre of the pan is mounted a conical shaped pestle, which is also an inverted truncated cone, but its incline is less than that of the pan; it may also be checkered or fluted. This pestle is, by preference, fixed to the piston rod of an ordinary steam hammer, which piston rod is firmly guided. The pestle may be moved up and down by an ordinary eccentric motion, or it may be coupled direct to the piston of an ordinary steam engine.—Patent completed.

3108 J. Griffiths, Chesterfield. Iron or steel piles.

it may be coupled direct to the piston of an ordinary steam engine.—Patent completed.

3108 J. Griffiths, Chesterfield. Iron or steel piles. Dated October 9, 1868.

The exterior of the pile is made of four bars or plates; the top and bottom bars overlang or embrace the side bars and hold them in their places. The inner faces of the overhanging edges of the top and bottom bars are inclined, and the edges of the side bars are also inclined so as to fit against the inclined faces of the top and bottom bars, and form therewith what is commonly known as a scarf joint. The interior of the box or case of the pile thus formed is filled with bars or scrap, the said bars or scrap being arranged to suit the particular manufacture to which the pile is to be applied.—Patent abandoned.

3109 D. and G. HALLAS and L. J. WOODHOUSE. Regulating gas burners. Dated October 9, 1868.

A tap or cock of peculiar construction is used. On the face of the centre part, within which the cock turns, an index marked at given intervals is placed, in order to denote that when the handle of the cock is severally opposite to them, gas for the various numbers of lights which they denote is being passed through. The rotating part of the cock itself is made hollow, and pierced in its circumference with holes of varying size, so regulated that each is capable of supplying a given number of lights, and no more, and the gas is emitted into the supply pipe through an eblong port or slot in the cock which is opposite the holes.—Patent abandoned.

310 G. P. Grant, Wandsworth. Cast bushes. Dated

through an oblong port or slot in the cock which is opposite the holes.—Patent abandoned.

3110 G. P. Grant, Wandsworth. Cast bushes. Dated October 9, 1868.

This consists in forming one or more small V-shaped projections or rings on the under side of the flange of the bung bush and extending it. The projections are to be pressed into corresponding grooves cut in the wood at the time the outside of the stave is being faced to receive the flange of the bung bush. The bush is liked in the cask or similar vessel by expanding the whole or parts only of the circumference of the inner edge of the ferrule of the bush into the wood of the stave, so that a reverse como or dovetail shall be formed in order to prevent leakage, and to secure the bush firmly in the stave. The inner edge of the bush may be corrugated to facilitate its expansion without rupture, or it may be left plain. V-shaped grooves are also formed on the outside of the conical part of the bush at right angles to and intersecting each other, so as to produce a number of points, which are pressed into the sides of the bung hole in order to retain the bush in the stave.—Patent completed.

# APPLICATIONS FOR LETTERS PATENT

Dated April 12, 1869.

Dated April 12, 1869.

1115 W. Crombleholme, Manchester. Improvements in apparatus for registering the number of persons entering into, and going out of, public vehicles and buildings, or places of amusement, or over bridges.

1116 E. D. Temple, King William-street, City. Improvements in railway signals.

1117 J. Kirk, Woolwich, Kent. Improvements in cabs, carriages, or other vehicles.

1118 S. F. Shore, Balance-hill, Uttoxeter, Staffordshire. Improvements in apparatus for propelling railway carriages, trucks, and other vehicles.

1119 J. Easton, Taunton. Somersetshire. Improvements in the construction of drop drills.

1120 W. R. Lake, Southampton-buildings, Chancerylane. An improved railway.

1121 E. Beanes, Cordwalles, near Maidenhead, Berks. Improvements in brewing.

1122 A. d'Azambaia. Joinville-le-Pont, France. Improvements in the manufacture of felted fabrics.

Dated April 13, 1869.

1123 H. Browne, Liverpool. Improvements in veloci-

1123 H. Browne, Liverpool. Improvements in veloci-

1194 C. D. Abel. Southampton-buildings, Chancery-lane. n improved machine or apparatus for aerial navigation. 1125 S. Holman, Laurence Pountney-lane, City. Im-



provements in velocipedes, parts of which improvements are also applicable to lifts, cranes, and other revolving

provements in velocity.

provements in velocity.

1126 T. F. Cashin, Gresham House, Old Broad-street, ty. Improvements in indicators in connection with itches or points on railways.

1127 T. B. Burns, Camelford, Cornwall. Improvements in the construction of cases to be employed with breechloading frearms to render them available for use with ordinary loose ammunition.

1128 W. Brock, Glasgow. Improvements in, and connected with, slide valves.

1129 J. Boberts, Birmingham. Improvements in draw plates or fire hasteners.

1180 C. Turner, Southampton. Improvements in cowls for chimneys and shafts.

1131 B. J. B. Mills, Southampton-buildings, Middlesex. Improvements in the manufacture of boots and shoes, and in machinery employed therein.

1182 E. E. and C. Marshall, Cheltenham, Gloucestershire. Improvements in apparatus for distributing fumigating matter, in order to destroy insects and files on plants.

plants.

1133 W. Gillespie, Coupland-terrace, Plumstead, Kent. Improvements in furnace bars, and in the mode of arranging and using them so as to consume smoke and economize fuel.

1134 W. E. Newton, Chancery-lane. Improvements in joints for railroad rails.

1135 A. V. Newton, Chancery-lane. An improved construction of fan blower.

1136 J. H. Johnson, Lincoln's Inn-fields. Improvements in machinery or apparatus for making compound telegraph wire or conductors.

1137 F. Erskine, Manchester. Improvements in firebars and arrangements for economizing fuel and constraints.

bars and arrangements for economizing fuel and con-suming smoke, applicable to steam boiler and other fur-

1138 J. H. Johnson, Lincoln's Inn-fields. A dental

naces.

1188 J. H. Johnson, Lincoln's Inn-fields. A dental wash.

1199 M. Samuelson, County-buildings, Kingston-upon-Hull, and C. Eskrett, Kingston-upon-Hull. An improved combined metallic envelope and filling plate to be used in expressing oil or fatty matters from seeds or other oil or fat yielding substances, and especially in the manufacture of oil cake.

1140 J. Leechman, Angleses. Villas, Hammersmith, Improvements in steam engines.

Dated April 14, 1869.

1141 E. Dowling, St. John's Wood, Middlesex. Improvements in planoforte actions.

1142 J. Chandler, Cottage-grove, Mile End-road, Middlesex. Improvements in planoforte actions.

1142 J. Chandler, Cottage-grove, Mile End-road, Middlesex. Improvements in apparatus for drawing and preventing waste of water from pipes, mains, cleterns, or other sources used for domestic or other purposes.

1143 P. A. Blake, Aberdeen Park, Highbury, Middlesex. An improved safety explosive compound, and the apparatus connected with its use.

1144 A. H. Benton, Great Queen-street, Westminster. Improvements in the mode of jointing pipes and tubes, and in the packing employed therefor.

1145 W. H. and T. Hacking, and J. Chambers, Bury, Lancashire. Improvements in machinery for sizeing and preparing warps for weaving, also for improvements in looms for weaving, and for improvements in machinery for folding or plaiting woven fabrics.

1146 C. Keighley, Burnley, Lancashire. Improvements in velocipedes.

1147 J. M'Lauchlan, Clyde Pottery Company, Greencek, Benfrewshire. Improvements in the manufacture of retorts for reburning animal charcoal, for making gas, and for other like uses.

1148 T. Akinson, Bell-street, Preston, and R. Smith, Victoria Foundry, Bold-street, Preston. Improvements in the construction of indicators for indicating the distance travelled by carts, waggons, carriages, or vehicles of every description.

1149 J. Whiley and S. J. Peet, Leeds. Improvements in machinery for producing moulds and cores to be used in casting metals.

1150 B. W. Farey, Bermondsey, Surrey.

a team engines.

1161 W. Wright, Mostyn, Flintshire. Improvements in reating ores to obtain copper and other metals there-

treating ores to obtain copper and other mounts from.

1152 J. H. Johnson, Lincoln's Inn-fields. Improvements in apparatus for burning liquid hydrocarbons applicable to the generation of steam and other heating purposes.

1163 J. G. Jennings, Palace Wharf, Stangate, Lambeth. Improvements in building blocks, and in the construction of buildings, and in appliances necessary to warming and draining the same.

1154 T. White, Birmingham. Improvements in nutorackers and lobster crackers, and in apparatus to be used with nutcrackers.

1155 W. Gradwell, Manchester. Improvements in steam boilers.

1155 W. Gradwell, Manchester. Improvements in steam boilers.
1156 C. T. Swanston, Holly House, Twickenham, Middlesex. Enabling railway trucks and carriages to be drawn by horses or traction engines on common roads, so as to prevent the necessity of loading and unloading at railway stations.

1157 A. M. Clark, Chancery-lane. Improvements in the manufacture of india-rubber nipples for feeding bottles, and in the means employed therefor.

1158 C. E. Brooman, Fleet-street, City, patent agent. Improvements in apparatus for burning liquid hydrocarbons. (A communication).

cation).

Dated April 15, 1869.

1160 H. J. Worssam, Wenlock-road, City-road, Middlesex. Improvements in machinery for lifting casks, boxes, bales, or packages, from one floor to another.

1161 G. Black, Spittlegate, near Grantham, Lincolnshire, Improvements in agricultural drills for sowing grain and seeds with or without manure, and also for distributing

seeds with or without manure, and also for distributing manure.

1162 W. H. Buck, Stretford, near Manchester. Improvements in velocipedes.

1163 E. Cooper, Laurence Pountney-lane, City. Improvements in the manufacture of waterproof coats, and other waterproof articles of dress worn externally.

1164 R. Heyworth, Manchester. Improvements in water-closets, and in self-acting apparatus connected therewith, part of which improvements is also applicable to urinals.

1165 A. W. C. Williams, Southampton-buildings, Chancery-lane. Improvements in bottles and jars for preserving fruit and other substances, and in stoppers for the

anne.

1166 F. J. Bramwell, Great George-street, Westminster. Improvements in steam engines and furnaces.

1167 J. Vivian, Falmouth, Cornwall. Improvements in engines, pumps, and machinery to be used in mining, partly applicable to other purposes.

1168 A. M. Clark, Chancery-lane. Improvements in compasses, and pen and pencil cases or holders.

1169 J. M. Johnson, Lincoln's Inn-fields. Improvements in motive power engines and steam generators.

1170 W. J. Cowlman and A. Doe, New Windsor, Berks. Securing greater accommodation and facility in the use of school desics, tables, and seats, which is also applicable for other purposes.

of school desks, tables, and seats, which is also applicable for other purposes.

1171 A. K. Rider, New York, U.S.A. Improvements in valves and valve gear for steam engines, and in the means for operating and adjusting the same.

Dated April 16, 1869.

1172 F. Mulliner, Northampton. Improvements in the construction of wheeled carriages.

1173 L. Eggert and O. E. Pohl, Liverpool. A new mode of constructing vessels of war with due regard to their protection from shot and shell.

1174 F. F. Whitchurst, Cambridge Cottage, Richmondroad, Putney, Surrey. Improvements in apparatus and machinery for mashing grain and obtaining products therefrom.

nerefrom.

1175 B. Legg, Owen's-row, Clerkenwell, Middlesex.

urther improvements in machinery for spinning or

therefrom.

1175 B. Legg, Owen's-row, Clerkenwell, Middlesex.
Further improvements in machinery for spinning or
twisting and winding tobacco.

1176 W. H. Thick, Kentish Town, Middlesex. Improvements in fret cutting or sawing machines.

1177 S. Harrison, Liverpool. Improvements in apparatus, and arrangement of same for ventilating, gaining
access to, and flushing, street and other sewers and drains,
also in purifying the noxious gases arising therefrom,
parts of which improvements consist in gully stench traps.

1178 G. T. Bousfield, Loughborough Fark, Brixton.
Improvements in the manufacture of heavy hydrocarbon
oils, and in apparatus used therein.

1179 A. F. Craig, Paisley, Renfrewshire. Improvements in apparatus for cutting or dividing pasteboard or
other sheets to form cards and the like.

1180 J. H. Johnson, Lincoln's Inn-fields. Improvements
in firearms, and in elevation sights for the same.

1181 W. E. Newton, Chancery-lane. An improved
sefety attachment to be adapted to burners for burning
explosive gases for illuminating and other purposes.

1182 J. Ives, Thame, Oxfordshire. An improved construction of velocipede.

Dated April 17, 1869.

1183 P. Bogler and H. Kayser, Vienna, Austria. An
improved lift for raising and lowering merchandize and
weights of all descriptions.

1184 E. T. Hughes, Chancery-lane. Improvements in

weights of all descriptions.

1184 E. T. Hughes, Chancery-lane. Improvements in rifled firearms and ordnance, and in ammunition for the

ame.

1185 P. Bogler and H. Kayser, Vienna, Austria. Improvements in means and apparatus for regulating or controlling the delivery of tickets at railway stations and other similar places, part of which invention is applicable to telegraphic purposes.

1186 F. J. Knewstub, St. James-street, Middlesex. Improvements in the process of printing.

1187 H. W. Dee, Sherwood-street, Golden-square, Middlesex. Improvements in making bottles, jars, and similar articles, air and liquid tight.

1188 T. Amies, Peterborough, Northamptonshire. Improvements in apparatus for heating water for warming greenhouses and other buildings, and for other purposes.

1189 J. Willats, Stamford-road, Kingsland, Middlesex, and A. J. Martin, Stratford, Essex. A new mode of advertising.

and A. J. Martin, Stratford, Essex. A new moue or advertising.
1190 T. Page, Adelphi, Middlesex. Improvements applicable to rail, tramway, and road locomotives. Dated April 19, 1869.
1191 A. Smith, Mauchline, Ayrshire. Improvements in ornamenting hats, caps, bonnets, and other coverings for the human head.
1192 R. Chapman, Berwick-place, Bellevue, Shrewsbury. Improvements in railway fish plates, and the mode of fix-ing the same.

ing the same.

1193 J. Horsley, Cheltenham, Gloucestershire, provements in the manufacture of blasting pow

1193 J. Horsley, Cheltenham, Gloucestershire. Improvements in the manufacture of blasting powder or explosive compounds.

1194 H. A. Bonneville, Sackville-street, Piccadilly. An improved apparatus to manufacture the rims of hats.

1195 P. Bourchani, Paris. Improvements in the construction of hydraulic barometical apparatus for raising beer, wine, and other liquids.

1196 W. H. Smith, jun., Salisbury-street, Strand, W.C. Improvements in lavatories, and in taps, valves, and fittings to be used in connection therewith, for regulating the admission and discharge of water, which taps and valves are also applicable to other purposes.

1197 H. Aitken, Falkirk, Stirling. Improvements in treating iron ores or iron stones.

1198 J. E. Ward, Bredbury, Chester. Improvements in nats or coverings for the head, and in the construction or manufacture of the same.

1199 A. V. Newton, Chancery-lane. Improvements in friction matches, and in match boxes or holders for containing the same.

1200 H. V. D. Scott, Ealing, Middlesex. Improvements in pottery ovens or kilns and glass and other furnaces.

1201 S. Shaw, Southampton-buildings, Chancery-lane. An improved feed-water apparatus, chiefly designed for supplying and maintaining a proper water level in steam bollers.

PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the following numbers:—

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Gazette," April 20, 1869. From the "London G 3705 H. Denton 3719 J. Ridley 3722 W. R. Lake 3728 A. Mackie 3731 J. A. Farwig and C. Haynes 3731 J. A. Farwig and J. Cotterill 3740 C. P. Cotton and J. Lyster 3747 J. T. Parlour 3755 J. Norman 3764 J. F. Bentley 3771 W. H. Bailey 3775 J. Millward zette," April 20, 1869.

3855 J. Hodgson, H. Bottomley, and E. Cockroft

3863 E. P. H. Vaughan

3869 M. S. Maynard and B. Grime

3874 G. H. Asker

3878 W. F. Stanley

3892 H. W. Hammond

3912 A. Sezille

3914 J. G. Jennings

3934 C. D. Abel

3974 E. T. Noualhier

99 P. M. Barnett

147 J. B. Whitehall

171 H. W. Hammond

654 A. A. L. P. Cochrane

791 J. G. Jennings

831 W. T. Sugg

831 W. T. Sugg

831 W. T. Sugg

841 G. T. Bousfield

899 C. B. Parkinson, A. and J. Metcalf, and W. H. Heald

960 H. Y. D. Scott

1022 J. Woods, J. Hampson, and L. and G. Fish

1029 C. Cairns

1090 W. B. Lake 3855 J. Hodgson, H. Bot-3775 J. Millward 37:5 J. Millward
3783 G. Preston and J.
Prestige
3787 G. A. C. Bremme
3788 H. L. D. Marsden
3791 W. Meakin
3797 W. J. Murphy
3801 A. Watt
3817 J. T. Grice
3824 J. B. Everard
3833 G. Ritchie
3834 S. C. Lister
3845 F. H. Knevitt and H.
H. Hazard H. Hazard

Sea J. Quick and J.

Sampson

Sampson

Sampson

3849 J. Pouncy

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

### LIST OF SEALED PATENTS. Sealed April 16, 1869.

Sealed Ap
3187 T. Wrigley and J.
Richardson
3193 W. H. Howes
3195 J. Rae
3204 E. T. Hughes
3205 E. Harrison
3208 E. T. Hughes
3213 W. Maudsley and W.
C. Rawlins
3214 J. Westwood
3218 C. Shaw
3219 I. Holden
3220 H. Clifton
3221 J. H. Johnson il 16, 1869.

3224 E. O. W. Whitehouse
3228 F. Bennett and B.
Ward
3231 J. Ryder
3250 J. Spratt
3292 A. H. Smith
3293 A. Wilson
3006 B. Dobson and J.
Clough
3314 H. Wallwork
3362 J. Corbett
3374 F. E. Martineau
3449 C. E. Brooman

Sealed April 20, 1869.

Sealed Apr 3093 J. and S. W. Varley 3240 J. Birch 3247 J. Bernard 3254 G. Nurse 3256 A. Giraud 3257 W. Reid 3259 S. Clark 3261 H. Mayhew 3273 W. E. Gedge 3288 W. D. Young 3290 E. T. V. Hecke 3000 G. E. Donisthorpe 3315 R. Oxland 3343 G. F. Morant 1 20, 1869.
3350 B. Hunt
3392 W. Corden
3400 P. E. de Wissocq
3417 W. Riddle
3424 W. S. Thompson
3450 J. Stephens
3470 J. C. M'Donald'and
J. Calverley
3542 J. Sims
3567 J. H. Johnson
3659 H. W. Fuller and L
W. Barnum
545 G. A. Fall 545 G. A. Fall 713 H. A. Bonneville

PATENTS ON WHICH THE STAMP DUTY OF £50
HAS BEEN PAID.

1083 T. Haimes 1088 G. White 1098 C. A. Girard and G. de Laire 1097 J. Holmes and J. C. H. Slack 1107 E. C. Nicholson 1112 C. Hastings, J. Briggs, J. Law, and H. Mitchell 1152 R. Thompson 1208 E. J. Beard

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1127 C. D. Abel 1150 H. Lumley 1164 J. C. Amos 1063 J. F. Spencer 1078 G. Fell and W. Haynes 1113 J. W. Ford

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2766 2767	0 4	2783 2785		2799 2800		$\frac{2811}{2812}$		2822 2823		2853 2855	
2770	0 10	2786	0 4	2801	0 4	2813	0 8	2824	0 4	3534	0 4

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THE

# MECHANICS' MAGAZINE.

LONDON: FRIDAY, APRIL 30, 1869.

# BOURNE'S AUXILIARY PROPELLER.

THE pages of the Mechanics' Magazine and the records of the Patent Office alike testify to the many attempts that have been made to obtain an auxiliary propeller for assisting sailing vessels out of calms. The importance of such an application has ever been felt, but the want has never been practically satisfied. Trials of various schemes there certainly have been, but a close inquiry has not enabled us to discover that any of the plans so tried have ever outlived the experimental stage. Paddles and screws have been pressed into the service to supply the deficiency, but these appliances have ever carried with them insuperable objections. Either they have proved too cumbrous to be capable of being readily applied and removed, or else they had an insufficient grip of the water to propel a heavy ship efficiently without most of the power being lost in slip. In other cases, the form of the ship has been modified below the water for the reception of propellers. Her efficiency under sail alone has thus been impaired, and part of the hold has been occupied with machinery which required perforations to be made in the hull, just as in the case of full-powered steam ships. Seeing all this, and being fully alive to the importance of applying an auxiliary power to sailing vessels, Mr. John Bourne—who needs no further introduction at our hands—set himself to work to solve the problem. That he has effectually succeeded in so doing we shall That he make clear to all before we have concluded our present article.

The matter was brought directly under Mr. Bourne's notice by Messrs. Currie and Co., the owners of the Castle Line of fine sailing vessels trading between London and Calcutta. Considerable loss of time being frequently experienced on this route, by reason of dead calms, Messrs. Currie applied to Mr. Bourne to help them out of their diffi-This he did by devising an exceed-simple and yet thoroughly effective apparatus upon the principle of the vertical oar, moved with a sculling motion. The oar, which is hung upon a folding or lifting bracket above the water line, is moved to and from the side by a crank in connection with the steam gear. The feathering is effected by means of a short tiller, which is also moved by a crank, having the same throw, but set at a different angle from that of the crank which moves the oar to and from the side. The action is perfectly smooth and regular, and the propelling efficacy of the oar is equal at all parts of its throw—the diminution in the velocity of lateral movement to-wards the end of the throw being exactly compensated by the increase of the pitch, so that the amount of slip at all parts of the stroke is uniform, and no inconsistent motions are imparted to the water. At the end of the throw the pitch becomes infinite, or, in other words, the face of the blade stands in a line parallel with the keel. But at this point the lateral motion is infinitely slow; the oar, in fact, comes to a state of rest, so that neither at this nor any other point is the retrogressive slip other than a constant quantity. The amount of slip, moreover, is small, and the engine power is beneficially utilized in the propulsion of the vessel. In a screw, the propelling area is represented by the area of the circle in which the screw rotates, and in this propeller the propelling area is represented by the area of the arc in which the oar vibrates. As this area may pumping the ship, in extinguishing fire, and amount of travel they have, precludes the be made of any desirable magnitude, merely in furnishing fresh water for the crew, will possibility of noise or jarring. The pump,

by increasing the length of the oar and the length of its throw, it follows that sufficient propelling area, even for the largest ships, can be obtained by this expedient without any difficulty. The mechanism for moving and feathering the oar stands on the deck, and is worked in connection with the steam winches, so that the additional machinery for propelling in the case of vessels having steam winches is merely the oar itself and its connections.

Such, in brief, is the apparatus which Mr. Bourne has fitted to one of Messrs. Currie's ships, the "Warwick Castle," and the efficiency of which we saw demonstrated last Tuesday afternoon. The "Warwick Castle" is a fine vessel, of 1,160 tons burthen, and is now lying in the East India Dock, whence she will sail to-morrow (Saturday) for Calcutta. On the present occasion, three short runs were made in the small space that could be cleared in so crowded a dock. The apparatus answered admirably, and the ship was brought back to her moorings in each case by the propeller. In the third run, the pitch was slightly altered, and made a little finer, which had a visible and marked effect upon the speed, showing a decided increase in it. Of course, these trials were made over so short a run, that anything like the exact rate of speed could not be correctly ascer-tained. But the ship will be put through further experiments after leaving the dock, the results of which we hope to place before our readers next week, together with an illustrated description of the apparatus itself. The trials of last Tuesday, however, go far to show that the apparatus will move a ship of large tonnage from a state of rest, and, this accomplished, her onward motion follows as a matter of course. Mr. Bourne expects a speed of about two knots an hour to be got out of the vessel with this propeller; we think he estimates it rather low, and should not be surprised if the trials in open water gave a better result than this. But even if it does not, we shall be well satisfied with the above rate of speed, which will be a great boon to a sailing ship in a dead calm.

It will be seen that by the apparatus under

notice all the evils of auxiliary methods embodying the paddle or the screw are avoided. and the small amount of steam power required to work the cargo winches in harbour is rendered available for the effectual propul-sion of the vessel in calms, merely by letting down a sculling oar vertically on each side of the ship; or one oar only on one side may be employed, as in the case of the "Warwick Castle." In the use of these vertical oars, moved with a sculling motion, there is nothing absolutely new, as the galleys of the ancients were propelled in this manner; and Mr. Bourne does not pretend that these oars are more efficient than either paddles or screws encountering an equal area of water. But in the case of a paddle or screw having an equal propelling area, those instruments would become so large and cumbrous as to be really unmanageable as auxiliary propellers. On the other hand, in the case of a sculling oar, no such impediment occurs, and it may be both dropped into the water and lifted out of it with the greatest facility.

The whole apparatus and gearing weighs under 30cwt., and it is readily taken to pieces and stowed away within a very small space. Then, as to cost, the extra expense is not worth consideration in view of the advantages obtained. The cost of a steam winch is about £150, and for another £150 the auxiliary propeller can be added, and only requires the aid of the steam winch at the very time when it is unemployed. The use of an efficient auxiliary apparatus to propel vessels in calms will almost always save several days on an eastern voyage, and sometimes several weeks; while the application of steam, which may also be made useful in

add to the safety of the voyage, while imparting a uniformity in its duration such as could not otherwise be attained. These considerations, at all times important, have attracted renewed attention from the expected opening of the Suez Canal at no distant date, when it will be found advantageous to sailing ships to be able to propel themselves through the canal, without being put to the expense of employing tugs. Ships of 1,000 to 1,500 tons may be propelled by Mr. Bourne's apparatus, at a speed of about two knots an hour, with an indicated power of eight or ten horses, and with a consumption of about 30lb. of coal during each hour that or about 3010, or coal during each nour that the propeller is in use; so that, look at it which way we will, we can only see reason to congratulate Mr. Bourne upon the happy application of the principle of the vertical sculling oar, and shipowners upon now being placed within their reach the means of shortening the passage of vessels under the in-fluence of that bele noir of seamen and shipowners-a dead calm.

# ATMOSPHERIC MONEY MAKING.

IN the very long list of "things not generally known," may be placed the fact that every coin of British mintage, circulating in these realms, owes its ornamentation to the pressure of the atmosphere. The medals which decorate the breasts of so many of our gallant soldiers and sailors have derived their impressions from the same source, and, in point of fact, therefore, the atmosphere is our chief coiner and chief medallist. This potent official does his duty to perfection, and his services—unlike those of other servants of the State—are rendered gratuitously. Let us endeavour to explain the mode by which atmospheric money making is carried on at the Mint, and how it is that the air which sustains our lives is made to stamp the coins carried in our pockets. The main feature in the process of atmospheric coining is the air-pump, for, in order to use the atmosphere effectually as a mechanical power, a vacuum must somehow be first created. The air-pump used for the purpose of coining at Tower Hill is of peculiar construction, and was originally invented and introduced into the Mint by Mr. Newton, an officer of that establishment, and president of the Foremen Engineers' Association. It consists of a castiron cylinder, closely resembling in exterior appearance that of an ordinary land steam engine, but of very different internal construction. The piston is a solid body surrounded by elastic metallic bands, which are pressed outwards by springs, so as to fit the cylinder in an airtight manner. The base of the cylinder is a hollow casting of iron, and its cover is of the same material These casings. or jackets, as they may be termed, are in reality the receptacles for a great number of small inlet and outlet valves. The upper casing contains no less than sixty-four valves, all of which are of the simplest form and, indeed, are nothing more than narrow strips of sawplate, 3in. in length, and each attached by a screw at one end. Thirty-two of the spring valves open outwardly to the atmosphere, and thirty-two inwardly to the exhaust pipe. The lower casing is similarly fitted. diameter of the air-pump cylinder is 42in., and the length of stroke of the piston is 36in. A vertical rod dependent from the beam of a steam engine—which also pumps water from a deep well for the supply of the Mint—works the piston. Communications by covered easings outside the cylinder are made between the upper and lower delivery and exhaust pipes.

By this mode of construction, it will be seen that Mr. Newton's air-pump is made double-acting, for it both exhaust and delivers air at every upward and downward stroke. The great number of valves, and the small

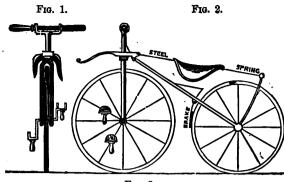
in fact, is absolutely silent in its operation, and it works with the greatest smoothness. It has been in action for several years, and has been the medium for coining upwards of one hundred millions of sovereigns, besides 3,000 tons of bronze coin. Its original cost, with 200ft. or 300ft. of 12in. cast-iron connecting pipes, and gauges, was £350, and it has never once been out of order. As compared with the expense of the system of coining practised before its introduction to the Mint, the atmospheric coiner of Mr. Newton saves the country not less than £200 per annum. That gentleman is not, however, a military officer, and, therefore, perhaps, he has never been rewarded by the Government for his valuable invention.

It has been said that the exhaust pipe was about 200ft. in length. That, indeed, is the distance between the air-pump and the coining presses, and the communication is made over the roof of the coining department. At the right point for the purpose, the exhaust pipe dips downward, and is united to a vacuum chamber. This is a long cylindrical vessel of cast iron, some 30in. in diameter, and placed along the floor in a line parallel to that of the eight coining presses. When the air-pump is in action, this chamber is exhausted to an extent which may be regulated to infinite pricate by a relief valve and lated to infinite nicety by a relief valve and barometrical gauge. That extent is varied with the size of the medals or coins to be atmospherically struck, and the depths of their respective impressions. A Crimean medal, for example, demands a heavy blow perhaps more than one, if the metal be not kind—whilst a sixpence requires but a light touch to give it head and tail. The amount of pressure employed in these and all intermediate cases is indicated on a graduated mercurial gauge. Thus, it will be seen, that an easily governed vacuum—the first and principal step towards atmospheric money making
—has been gained. Along the top of the vacuum chamber, and supported by pipes opening into it, are eight open topped cylinders of 12in. diameter. These stand vertically, and working in each there is a leather-packed piston. The pistons are the media upon which the atmosphere will, at the proper moment, act, that is, when pneu-matic valves below them open into the vacuum chamber. The air within the cylinders then rushes down to the exhausted tube, the atmospheric column drives the pistons after it to the bottom of the cylinders, and the pistons, being connected with the striking screws of the presses, bring them forcibly in the same direction. At the same instant, and by the same subtle and invisible, yet powerful, agency—the air—the dies are made to compress softened discs of metal between them, fasting impressions are communicated, and money is made. The press-screws rebound, carrying up the pistons, the pneumatic valves are forced open by springs, the pistons again fall, the dies descend upon new blanks supplied to them by mechanical fingers, and another batch of sovereigns—it may be—is literally pumped into existence, owing thus their lives and attractive features to wondrous power of the air.

# VELOCIPEDES.

THE world at the present moment is in a state of considerable excitement, the cause of which is the revival of an old method of locomotion—that by means of the velocipede. Paragraphs have of late appeared in our columns, from time to time, touching upon new phases of the question. But as there has hitherto been more of sensation than of science in it, we have not thought fit to trouble our readers with particulars, which they could glean from the daily papers or even from the posters about the London hoardings. As, board carrying a seat, properly balanced and however, we have had enquiries of late from two somewhat remote districts, we purpose this seat, a bar passed obliquely downward; Some manufacturers have large places in saying a few words on the subject, for the at the end of these bars, a wheel was placed which purchasers are instructed in the

VELOCIPEDES. MODERN





edification of those who may not have posted themselves in the most recent practice of the velocipede. The past history of the question will be found in our volumes, or may be traced by the aid of the Patent Office specifications. The original inventor of the velocipede appears to have been M. Niepce, as shown by some letters written by his brother in 1818 and 1819, extracts from which have appeared in the "Moniteur de la Photographie." Our volume for 1831, contains a letter over the signature of "Saxula," proposing that a man should wheel himself up an incline in a wheelbarrow without touching the ground. In 1824, a Mr. Jameson described in our columns a velocipede, constructed similarly to a Bath chair. This arrangement—the tricycle, as it is termed—is not, however, so safe as the four-wheel system, which has generally been adopted until lately. The two-wheeled veloadopted until lately. The two-wheeled velo-cipede, or bicycle, is not an entirely new idea. Nearly forty years since, one was described, which was moved by means of a large screw connected to various cogged wheels, set in motion by the rider turning a handle. The carriage itself was of a peculiar construction, there were only two wheels, one before and one behind; but at each side were four iron rods, with small wheels attached to the ends.
In Volume XXXIV. of the MECHANICS'

MAGAZINE for 1841, is a letter, which states that the first velocipede was introduced in France ("L'Historie se repete"). This velocipede ("L'Historie se repete"). This velocipede consisted of two wheels, about 21ft. or 3ft. in diameter, connected by a pole, one wheel being in front and the other behind; the rider sat on a seat across the pole, and propelled himself by striking the ground afternately with his feet. The second made, consisted of two wheels, 5ft. or 6ft. in diameter, between which the rider balanced himself on a seat, propelled as before. A velocipede, coming nearer to the one now in use, is also described in the same volume. It is a velo-cipede which had two wheels of about 6ft. in diameter, of the lightest construction, placed 3ft. or 4ft. apart, and connected by an axle-

12in. or 18in. in diameter. The wheel reached within 6in. or 8in. of the ground, and the rider had two stilts, made of bamboo or other light material 18in. to 30in. below the feet, provided with flat stirrups to support his feet. Velocipedes of many kinds have his feet. Velocipedes of many killed been invented and constructed at various times, although the safe four-wheeler has been the form most generally used. The bicycle is the style now adopted, no one condescending to mount a machine which does not tax the skill and dexterity of the trundler. Besides, a bicycle, well managed, has a far more graceful appearance than is presented by the other forms. Such is the rage for these machines at the present time, that manufactories for their production, and schools for teaching their use, are being established in all directions.

The accompanying engravings show the construction of two forms of the modern bicycle, or two-wheeled velocipede. represents a front view, and fig. 2 a side elevation, of a bicycle with a self-brake, actuated by the handle in front of the rider, and by which he has the power of stopping instantly; fig. 3 is another form of velocipede. Each example is very light, and of elegant construction. We have selected elegant construction. We have selected these from a number, which are manufactured by Mr. A. Davis, of No. 14, Strand. Mr. Davis has also written a little pamphlet, giving the history of the vehicle, and tracing it through its various modifications, from the earliest time down to the present. pamphlet will be found both interesting and instructive, as it gives directions for the use of the velocipede. With regard to the velocipede question in France, Mr. Davis observes that manufactories have been established on a large scale in Paris elsewhere, and the new carriages are constructed on very scientific principles—light and elegant, with all kinds of delicate appliances. They are generally made with only two wheels (bicycles), while those constructed with three wheels are called tricycles. The word velocited being the tricycles. The word velocipede being too long, it has been abbreviated to velox.

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management of their carriages, and three or four lessons are said to be sufficient to form competent velocipedists. Many young men have adopted them, and in the country the velox may be seen awaiting its master at the railway station. In one case, an economical application has been made of the tricycle, the rural postmen of the department of the Aube being provided with them, and considerable time is thereby saved in the delivery of letters in consequence. A box is attached to the machine in which the postmen are allowed to carry parcels for customers, so that a regular parcels delivery is established in the district, and the charge for the parcels soon pays for the velocipede. The spider-like structure of the velocipede makes it very dangerous to pedestrians at night, and those in Paris are now provided with a small lantern to prevent accidents.

From our neighbours across the Channel the furore migrated to our brethren across the Atlantic, passing over us. The go-ahead vehicle is exactly suited to American ideas. Walking, say the New York wags, is on its its last legs. Schools, with the imposing name of "Velocinasiums," for teaching the young idea how to gyrate, are being established; races are being rolled; men and boys are being whirled here, there, and everywhere at the speed of twelve miles an hour. Inventors are improving the machines, and manufacturers are making them wholesale, the supply at present falling short of the de-Our turn has come, and, after a lapse of thirty years, we find the velocipede mania revived. The advantages of this system of locomotion are considerable; we are entirely independent of exterior aid in propelling our-selves, and while we, indeed, in doing work, consume a certain amount of energy, we have the satisfaction of replacing that in the desirable shape of food. The velocipede eats nothing, costs nothing to preserve it in working order, requires no extra attention or looking after, and is ready for our pleasure or necessities at a moment's notice, so that, in proper hands, it is a safe and convenient method of personal transport.

# ROYAL INSTITUTION.

ON Saturday afternoon, April 10, Mr. Archibald Geikie, F.R.S., director of the geological survey of Scotland, lectured upon the origin of land surfaces. The next Saturday he gave a second lecture on the same subject. He principally devoted his attention to denudation, or the wearing down of hills and valleys by the action of water. He said that water acts more rapidly in changing the external features of a country than is commonly supposed, and gave the best evidence to be had, tending towards the conclusion that in one million years—a very short time in geological science—the present action of rain and rivers is competent to scoop out a valley of very considerable dimensions. He narrated how the freezing of water in the cracks of cliffs gradually detaches large fragments of rock from the main body, and he explained that springs of water escaping from the middle of a cliff tend to undermine and overthrow superincumbent strata. Lastly, he called attention to the action of glaciers in the formation of undulating land surfaces, for these vast masses of ice rub down the uneven surfaces of the land over which they travel, and polish their paths to some extent by means of stones and mud.

On Tuesday, April 13, Professor Grant F.R.S., gave a second lecture upon the fixed stars. In this lecture he described their apparent motions through the heavens, and gave the following figures as to the relative brightness of those whose light has been measured photometrically:—Sirius 1,000, Alpha Lyrs 617, Alpha Aquils 450, Procyon 445, Rigel 439, Alpha Orionis 411, Alpha and showing that the centres of spherical tion with a spiritual world, by means of raps.

Virginis 310, Aldebaran 220. In calling lenses bring objects to a focus at a further table motions, trances, and other phenomena.

attention to the phenomena of coloured stars, he remarked that when double stars are coloured, say green and red, the inhabitants of worlds revolving round such suns must have rather a peculiar time of it, for they must have a green day or a red day, according to which sun chances to be above the horizon at the time. When speaking of the fact that the fixed stars are suns, he narrated how an Italian astronomer once suggested the same thing, and for expressing an opinion so full of heresy, he was tied to a stake and roasted alive by the church. On Thursday, April 15, Professor Tyndall, LL.D., lectured for the second time upon "Light." This lecture also was of an elementary character, and explained the laws which govern the reflection of light from concave and convex mirrors, also the laws of the refraction of light by transparent media and lenses. When an inverted image of an object is cast upon a screen by a lens, it is possible to reverse the image and bring it upright by the intervention of a rightangled isosceles prism, which is a fact worth knowing by those who use magic lanterns. The lecturer illustrated this experimentally. In explaining the cause of the whiteness of the foam of the sea, Professor Tyndall said that in the passage from one medium to another of a different refractive index, light is always reflected; and this reflection may be so often repeated as to render the mixture of two transparent substances practically impervious to light. It is the frequency of the reflections at the limiting surfaces of air and water that renders foam opaque. The blackest clouds owe their gloom to this repeated reflection, which diminishes their transmitted light. Hence also their whiteness by reflected light. To a similar cause is due the whiteness and imperviousness of common salt, and of transparent bodies generally when crushed to powder. The individual particles transmit light freely; but the reflections at their surfaces are so numerous that the light is wasted in echoes before it can reach to any depth in the powder. The whiteness and opacity of writing paper are due mainly to the same cause. It is a web of transparent fibres, not in optical contact, which intercept the light by repeatedly reflecting it. But if the inter-stices of the fibres be filled by a body of the same refractive index as the fibres themselves, the reflection at their limiting surfaces is destroyed, and the paper is rendered transparent. This is the philosophy of the tracing paper used by engineers. It is saturated with some kind of oil, the lines of maps and drawings being easily copied through it afterwards. Water augments the transparency of paper, as it darkens a white towel; but its refractive index is too low to confer on either any high degree of transparency. It, however, renders certain minerals, which are opaque when dry, translucent.
Mr. W. Carruthers, F.L.S., of the British

Museum, lectured on Friday, April 16, upon "The Cryptogamic Forests of the Coal Period." In the lecture, he confined all his remarks to a very technical botanical de-scription of the several parts of one or two tree ferns, and afterwards drew the conclusion that two of them, from 30ft. to 60ft. high, are represented in our present vegetation only by our common horsetail and lycopodium.

On Tuesday, April 20, Professor Grant, F.R.S., delivered his third lecture upon "Stellar Astronomy," and spoke chiefly of temporary and variable stars. He showed that the fact of the temporary character of some stars has been thoroughly authenticated, and he said that the number of stars which are known to vary regularly and periodically in brightness, now exceeds 100. There are also a few irregularly variable stars.

On the following Thursday, Professor John Tyndall, LL.D., gave his third lecture upon "Light." After explaining the refracting properties of lenses of different shapes, and showing that the centres of spherical

distance than the outer portions of the same lenses, so as not to throw a perfect image, he exhibited two dioptric pieces of apparatus lent him from Trinity House. One of them was the lantern used with the electric light at Dungeness, and consisted of a bent cylindrical plane convex lens round the source of light, and an arrangement of bent prisms above and below this lens, so that the light, after falling upon one surface of the prisms at the angle of total reflection, is thrown out in a horizontal direction. All lighthouse appa-ratus is constructed on this principle. The other lantern showed the method of producing revolving lights. Much of this lecture was occupied in the explanation of the optics of the human eye. Every eye has a blind spot where the optic nerve enters the eye, and the presence of this blind spot may be made evident by the following experiment:two black wafers or large spots of ink three inches apart upon a sheet of white paper, and place the left eye vertically about a foot above the right-hand wafer; then close the right eye, and while looking at the right-hand wafer, the left-hand one will be invisible, because its image falls upon the blind part of the retina. Professor Tyndall also said that almost every eye contains bodies more or less opaque distributed through its humours. The so-called musco volitantes are of this racter; so are the black dots, snake-like lines, beads, and rings, which are strikingly visible in many eyes. Were the area of the pupil contracted to a point, such bodies might produce considerable annoyance; but because of the width of the pupil, the shadows which these small bodies would otherwise cast upon the retina are practically obliterated, except when they are very close to the back of the eye. It is only necessary to look at the firmament through a pinhole to give these shadows greater definition upon the retina. The veins and arteries of the retina itself also cast their shadows upon its posterior surface; but the shaded spaces soon become so sensitive to light as to compensate for the defect of light falling upon them. Hence, under ordinary circumstances, the shadows are not seen. But, if the shadows be transported to a less sensitive portion of the retina, the image of the vessels becomes distinctly visible. The best mode of obtaining the transference of the shadow is to concentrate in a dark room, by means of a pocket lens of short focus, a small image of the sun or of the electric light upon the white of the eye. Care must be taken not to send the beam through the pupil. When the small lens is caused to move to and fro, the shadows are caused to travel over different portions of the retina, and a perfectly defined image of the veins and arteries is seen projected in the darkness in front of the eye. Looking into a dark space, and moving a candle at the same time to and fro beside the eye, so that the rays enter the pupil very obliquely, the snadow of the retinal vessels is also obtained. In some eyes the suddenness and vigour with which the spectral image displays itself are extraordinary; others find it difficult to obtain the effect. Finally, a delicate image of the vessels may be obtained by looking through a pinhole at the bright sky, and moving the aperture to and fro. He closed this lecture with the beautiful experiment known as Duboscq's electrical fountain, wherein the interior of a jet of water is brilliantly illuminated by rays from the electric light, and is made to take varying colours by the interposition of coloured

On Friday, April 23, Mr. E. B. Tylor lectured upon "The Survival of Savage Thought in Modern Civilization." He said that he intended to call attention principally to the great spiritualistic movement at present going on in England and America, the promoters of which teach direct communica-tion with a spiritual world, by means of raps.

He pointed out that savages almost all over the world hold the belief that it is possible for certain individuals in their tribes to become insensible, leave the body, enter the spiritual world, and come back to tell what they have seen, like Swedenborg; in fact, he said, the man goes mad and sees visions. After nar-rating that the untying, by spirits, of persons bound with ropes is known both in Greenland and Siberia, he pointed out that obtaining communications by writing has long been known to the Chinese. Rapping spirits were common in the middle ages, and "knockers" are known to the Welsh miners. The records of the doings of the early Christian saints swarm with accounts of the raising of the human body in the aira pastime in which one of the archbishops rejoiced exceedingly, and the mantle of that archbishop, said the lecturer, has evidently descended upon Mr. Home. The modern medium, he said, is nothing but a "medicine man in a dress coat." After lecturing for half-an-hour upon the alleged facts of the spiritualists, he said that he had never been to see any of them himself. He did not say that the facts were not real, but that the doctrine that they originate with spirits belongs to savages. In the course of his remarks he said that the custom in European and English churches of worshipping with the face to the east is of savage origin. The allegation that churches are so arranged because the east is the direction of Jerusalem is incorrect, because churches on the other side of Jerusalem all point steadily to the east.

On Saturday, April 24, Mr. Archibald Geikie, F.R.S., delivered the last of his lectures on the "Origin of Land Surfaces."

# THE INSTITUTION OF NAVAL ARCHITECTS.

THE last of the papers which were read at the meetings of this Institution was one by Mr. Charles H. Haswell, of New York, the title of which was "The Location of Independent Steam, Fire and Bilge Pumps in Steamers." The object of this paper was to The object of this paper was to point out the great dangers to a ship, arising from the fact that the pumps and the engines which work them are generally situate in the hold. It certainly is a surprising fact, that the pumps, on which the safety of the ship, in many cases, entirely depends, should be placed in the one of all places where they are the most difficult of access, and the soonest rendered perfectly useless when the ship is in a leaky state. Mr. Haswell contends most reasonably that the pumps and all their necessary concomitants should be placed where they can be most readily reached, and where they can be used for the longest period without being submerged, enveloped in smoke, or cut off by fire. He mentions three several vessels, the "Arctic," "Austria," and vessels, the "Arctic," "Austria," and "Britannia," all of which he believes to have been lost from the bad arrangement of their auxiliary engines. The remedy Mr. Haswell proposes, is, in his own words, "to require this pump to be located upon the main or tonnage deck, and that it have an independent boiler attached to it, located upon the main deck, or, preferably, upon the spar deck, in vessels having two or more decks; and that all passenger steamers be required to have this boiler ready for operation during the principle of the present of the prese the night or during the prevalence of a fog.

There were two other papers, which were sent in to be read at the meetings, but which were too late to be put in the ordinary list. They were merely taken as read. The first of these was by Mr. W. F. Reynolds, "On an Instrument for Determining the Deviation of Ships' Compasses"; and the second by Mr. J. S. Holland, "On Horse Power." Mr. Reynolds described an instrument, to which he has given the name of Palinurus. It is to be hoped that the ill fate of the gentleman from

whom the name is taken will not attend any helmsman, who may be enterprising enough to try the virtue of the instrument. The object that this instrument is designed to fulfil is "the production of a simple tool, capable of being readily understood, and easily used by an ordinary mariner, without reference to any abstruse calculations, and which is as reliable and perfect in the practical results of its operation as are the methods and formulæ of the mathematical navigator." We are afraid that Mr. Reynolds will not be so successful with his machine as he is sanguine enough to hope. Mr. Archibald Smith and Captain Evans would, no doubt, be among the first to rejoice in any plan which would render all their abstruse calculations unnecessary, and we should hail with delight any method which would get rid of the immense uncertainty which now attaches to the use of the magnet in iron ships. We, however, do not think that this object is to be attained so easily.

Mr. Holland's paper was an indignant protest against the use of the—we may almost say obsolete—nominal horse power. Why, he asks, should not engineers be allowed "the privilege of calling a spade a spade," and so be put on an equality with shipbuilders, who, Mr. Holland thinks, are allowed to call everything by its right name. We cannot entirely sympathise with this gentleman in his complaint. The word "ton" is in use in more senses than one in the shipbuilding world. We do not know that this tends to fraud or misrepresentation. If it does, an alteration should certainly be made without delay. So the use of nominal horse power, if it really does mislead even the average ignoramus who gives an order for an engine, should be discontinued. We do not think it does.

We have now given our readers a general resumé of all the papers which were read at the meetings of this Institution. We are sorry that once a year we are compelled to give our readers a surfeit of naval architecture and all its attendants. We really cannot avoid it. The naval architects meet but once a year. They are like the members of the British Association—dis-They are like the persed over the length and breadth of the land, and are not easily collected. We should be glad, for the interest of the Institution and for the benefit of the nation, to see some scheme proposed whereby all the points which interest a naval architect or a marine engineer would be brought to the notice of all the members of the two professions from time to time, as they arise. If, however, unavoidable difficulties attend this, we must be satisfied with the over-abundant harvest when it comes.

# BRONZE STATUE OF HER MAJESTY FOR MONTREAL.

A FEW weeks back we had occasion, in mentioning the casting of the statue of Lord Palmerston at Messrs. Holbrook and Co's works at Chelsea, to speak of a statue of Her Majesty for Montreal, Canada, the moulding of which was then rapidly approaching completion. We are now glad to record the successful completion of the work. This colossal figure, which is 10ft. high, independent of pedestal, has been cast in Florentine bronze metal, the proportions of which are:—copper 45, fine yellow brass 50, tin 4, and antimony 1. The effect of this mixture is a rosy tinged yellow metal, capable of taking a brilliant polish, and approaching, when polished, the lustrous purity of silver. It is a matter for regret that this beautiful composite metal is unsuitable for the embellishment of our metropolis. It, however, contains a greater proportion of alloy than the ordinary statue bronze, and this renders it more susceptible of oxidation. When

London atmosphere it would speedily show the progress of decay; besides, its purity and delicacy of colour effectually prevent it from occupying a prominent position in the London streets; every speck of soot would be plainly obtrusive to the eye, and the beauty of the material would be detrimental to its credit. We congratulate the inhabitants of Montreal upon the possession of a climate in which such a material may be exposed in the open air without any injurious effect.

The honour of the design is due to Mr. Marshall Wood, the sculptor. He has shown the Queen in an erect and commanding position, crowned and clothed in a classic manner. Her Majesty's countenance is a fine representation of the typical English woman; she bears in her hand a wreath of oak leaves and acorns. Very great difficulty was experienced in forming this part of the mould, owing to the intricacy of the foliage and complication in the mould which it entailed; but by dint of skill and perseverance, the mould was formed, so as to allow the figure to be cast in one piece. We have before had occasion to point out how much the success of the statue depends upon this. The running of this casting impressed one with the necessity of having powerful machinery in prosecuting this branch of industry. A huge cauldron, containing upwards of three tons of the molten bronze metal, was carried, without the slightest difficulty or apparent risk, from the furnace to the mould, by the traveller, and the contents deposited in a trough, from which, by numerous inlets, the metal was admitted to the mould. Although the actual weight of the statue will not exceed two tons, the surplus metal is provided for the purpose of forming a head above the casting, to act as a weight, in order to render the metal more dense, and to force it into the smaller crevices of the mould. From the present stage the statue will proceed to completion, under the immediate superintendence of Mr. Wood. However skilfully the model may have been formed, the chisellers must proceed under the direction of the artist.

Much of the success of bronze casting, as regards accuracy of the figure, depends upon the care with which the proportions of the alloys are chosen. It is a rule applicable to all alloys that thorough combination will only take place when the ingredients bear a definite atomic proportion to each other. Unless this is observed, the metal is not homogeneous, but consists of a number of varying compounds irregularly dispersed through the mass, which, when broken, will show a mottled appearance. The difference in the expansibility and elasticity of these compounds tends to cause the separation of the parts, and in time will produce a fracture. It is worthy of remark that the bronze manufacture has been for some years very much on the increase in England. This branch of industry is so nearly allied to the fine arts, that it affords a fair standard of the advancement of taste and spread of education. Mr. George Wallis, in a very able report on bronze in the Paris International Exhibition of 1867, says, "The conditions necessary for this branch of industry appear to be a knowledge of design and a love of art fairly spread through the people, partaking so largely of the highest elements of design, and depending for its success upon its relations with the art of sculpture in its best and most enduring forms. We can only consider the manufacture of bronzes a trade, so far as the power of reproduction and facilities of repetition will admit."

is a rosy tinged yellow metal, capable of taking a brilliant polish, and approaching, when polished, the lustrous purity of silver. It is a matter for regret that this beautiful composite metal is unsuitable for the embellishment of our metropolis. It, however, that the amount of bronzes exported from France has of late years very much declined. The following statistics by contains a greater proportion of alloy than the ordinary statue bronze, and this renders it more susceptible of oxidation. When exposed to the destructive influence of a

respectively, 44,000,000 francs, 40,000,000 francs, and 34,000,000 francs, thus showing a decrease of 10,000,000 francs in exports, and this he ascribes to competition of England, Prussia and Belgium. Very great pains have been taken in France to provide proper education for the workers in this branch of industry. So far back as 1840 we find Government schools for those engaged in the bronze manufacture. In these schools nothing was taught but what applied directly to the subject. On the schools being given up by the Government, the leading men of the industry formed themselves into an association, and continued to supply a fund to be distributed in prizes among the workmen of Paris. In fact, excellence in this manufacture appears to have been forced upon the workers rather than to have been the spontaneous consequence of the question of taste. It is a noteworthy circumstance that in the early part of the present century the bronze workers of Paris were so ignorant of the laws which affect alloys, that while some parts of the Vendome column contain proportions of 94 parts of copper to 6 of tin, other parts contain 99 4-5ths. copper, and alloy 1-5th. These defective proportions caused bad castings, so that the chisellers had to cut away 70 tons of protuberance on this one monument. Science in the present day is rather in advance of this, and although mistakes are sometimes made, they are not quite so gross as the above. In the statue of Her Majesty under notice, Messrs. Holbrook have adopted very excellent proportions for effect in such a climate as that of Montreal, and have achieved a second and important success in this special department of practical art.

NOTES ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL APPLICATIONS.

PHOTOGRAPHIC PICTURES TO REPRESENT MACHINERY IN MOTION-NEW MODE OF BURNING GAS-INTERESTING CHEMICAL DISCOVERY-THE PARIS EXPLOSION.

THE magic lantern with photographic pictures is coming more and more into use in illustrating lectures on all sorts of subjects. Photography is also extensively applied to the delineation of machinery. It has, however, hitherto shared the common defect of all drawings of being unable to give a representation of the machinery in motion; for "painting, mute and motionless, steals but a glance of time." Hence, the necessity for working models for the perfect illustration of mechanical contrivances. According to M. Bourbouze, however, he has partially, at all events, removed the disability under which the photographic art labours, of being unable to give a representation of a machine in motion. To illustrate Hugon's gas engine, for example, he takes separate pictures of the movable parts and another picture of the fixed parts. He then arranges the movable parts on cranks, the lengths of these cranks being calculated so as to show the proper motions and due proportions of the parts; and the whole system is set in motion by a winch and handle. Excepting, perhaps, some difficulty in gotting all the pictures into one focus, nothing possibly stands in the way of exhibiting representations of the kind magnified on a screen, and the use of the art in teaching mechanics will be obvious. We have in England some enterprising producers of photographic pictures for the magic lantern: perhaps they will try their hands on such slides as M. Bourbouze says he can produce.

The same ingenious gentleman, in conjunction with an engineer, M. Wiessneg, has another invention, or, rather, improvement, for we described the original idea more than a year ago. Then it was proposed to place a cylinder of magnesia on a sort of Bunsen's burner, and the incandescence of the magnesia, produced by the heat of the com-bustion of gas and air, was said to give more light than would be given by burning the gas in the ordinary way. It did not, however. Now, the inventors named above compress the gas—to what extent is not said. The compressed gas entering a tube mixes with air, and at the top of the tube (or Bunsen's burner, as we may call it), is a crown or button of magnesia projecting a little over, many hon members connected with the north of them, which ended in the wreck of one of her and enveloped in a platinum gauze, se arranged England, who are interested in this question, will Majesty's ships. An officer connected with her

that the combustion of the mixture takes place between the gauze and the magnesia. The gauze quickly becomes white hot, and together with the incandescence of the magnesia, exhibits an extraordinary amount of light. In fact, they an extraordinary amount of light. In fact, they tell us that a quantity of gas, which, consumed in the ordinary way, will give the light of three Bengel burners, will, when burnt in the way we have shortly described, show as much light as six burners of the same kind. Compressed gas in towns is of course out of the question; gas companies lose too much by the compression which gas is of necessity subjected to in their mains But if we can depend upon the results of MM. Bourbonzo and Wiessneg, it may offer a new class of consumers to gas companies. We well remember the day when compressed gas was sent all over the country. It was oil gas of much higher illuminating power than common coal gas; but if ordinary gas can be made portable, and to yield this increased amount of light, country gentlemen far removed from gas pipes, may light up their drawing-rooms more economically and brilliantly than by the means at present at their command.

We may briefly notice one very interesting chemical discovery. M. Fridal, who has done so much to show the close alliances which exist between carbon and silicium, has, in conjunction with Ladenburg, produced a compound which may be called an oxalic acid in which the carbon is replaced by silicium.

A last word on the Paris explosion. The Commission d'Hygiene et Salubrité, charged by the French Government to investigate the causes of the explosion, has separated without settling precisely what the cause was. It is probable that the Government is unwilling to let the world into the secret of its preparations. The French scientific journal, "Cosmos," however, states, what was at once guessed by all acquainted with the compounds, that the picrate of potash was probably mixed with chlorate of potash.

# PARLIAMENTARY NOTES.

YESTERDAY week, the question of the use of North Country coal in the Navy was touched upon by Mr. Vivian, who asked the First Lord of the Admiralty whether it was a fact that a decision had recently been come to by the Admiralty with reference to the use of North Country coal on board her Majesty's ships; and, if so, whether he had any objection to state what that decision was.

Mr. Childors said that in 1857, in consequence of a report from the West Coast of Africa station, in which the capture of a slaver was attributed to the use of smokeless coal, an order was given directing the disuse of bituminous coal for the present in any of her Majesty's ships. has now been carefully reconsidered and modified to a certain extent, and directions have been given, under which a certain admixture of coal, consisting of two-thirds Welsh and one-third North Country coal, will be used in her Majesty's ships, except on the China and West Coast Africa stations. Orders have also been given for the necessary changes in the furnaces.

At the same sitting, the overland route to Western China was discussed. Colonel Gray asked the Under Secretary of State for India if any, and what, stops were being taken by her Majesty's Government to promote the communication be-tween Rangoon and Western China through a portion of the Shan States; and if the survey of that

route was being proceeded with.

Mr. G. Duff said—Nothing further has been done with regard to promoting communication between Rangoon and Westorn China since the survey was discontinued, in 1867, after it had been carried on for 245 miles, nearly to the extreme boundary our territory. I hope the government of India will see its way to renew the unfinished work. If will see its way to renew the unfinished work. If it does so we shall be glad. But, at the same time, the Secretary of State for India would not dream of pressing the government of India to continue that survey if they were deliberately of opinion that by doing so they would be involved in grave political complications or incur any very great expense. The whole question of communication between India and Western China, of which the project for a communication through which the project for a communication through the Shan States is merely a fragment, and not a very large fragment, is one of very great interest; but it will, I think, become of greater practical importance to the next generation than to ours. But, interesting as it may be, and important as it may become, I think that the hon. gentleman, and

admit that in the Chinese peninsula, as in Abys-

sinia, we may possibly buy gold too dear.
On Friday night, Sir H. Croft asked the President of the Board of Trade whether the words "sea fishing boat," in the Sea Fishery Act, 31st and 32nd Vict., c. 45, were intended to apply to vachts which may occasionally be used in fishing. He desired to include in the question small pleasure boats for hire also.

Mr. Bright said the Board of Trade was not in a position to place an authoritative construction upon the words of the Act of Parliament, but he might tell the hon. baronet that it was not their opinion that these pleasure vessels were intended to be included. At this moment it was under consideration whether something should not be done expressly to exclude them, either by an Act of Parliament or by an order in council. He could not give any answer more definite, but he hoped that would be sufficient to relieve those who feared they might be put to inconvenience by the clause as it now stood

After this, Sir J. Hay followed with a question respecting the rule of the road at sea. He asked the President of the Board of Trade when the remainder of the correspondence on this subject would be laid on the table; and whether he would agree to a motion for the appointment of a committee of the House to inquire into the causes of the loss of life and property at sea by collisions, and as to the possibility of a remedy by some modification of the existing rules of the road, so as to bring them into harmony with the custom of the sea and the decisions of the courts of law.

Mr. Bright was not aware of any correspondence upon the subject that it would be advantageous to lay before Parliament. With regard to the committee, he thought the House would agree with him that its appointment would only disturb a question which appeared on the whole to be satisfactorily settled. When the hon, baronet himself was at the Admiralty, the Admiralty concurred in the arrangements which now existed; and if the committee were appointed it would be to disturb that which all other maritime nations in conjunction with this country had agreed to admit as settled, and, therefore, it was not the intention of the Board of Trade to recommend, nor would they be willing to consent to the appointment of any committee on the subject. With regard to the decision of the courts of law, he presumed that those courts would be obliged to give their decision in accordance with the Acts of Parliament, or with the order of council, which on that matter, he believed, had the same effect as an Act of Parliament.

Last Monday evening, the irrepressible and never-to-be-got-rid-of matter of the Banda and Kirwee prize money cropped up again. Mr. O'Reilly asked the Secretary of State for War if he could state why seven men of the 5th Battery, 17th Brigade, Royal Artillery (formerly A Company, 4th Battalien, Madras Artillery), now stationed at Dover Castle, who where entitled to a share of the Banda and Kirwee prize money, had not yet received it.

Mr. Grant Duff said the delay had occurred because the Indian Government were assured by the Government of Madras that this money had been paid in India to the officer commanding the battery to which these men belong. There was, however, evidently some mistake, as that officer said he never received it. The Government of Madras had been asked to make a strict investigation into the facts, and he trusted soon to have the mistake set right. Always mistakes and delays, unfortunately, on the wrong side for the hoping recipients of this dilatory cash.

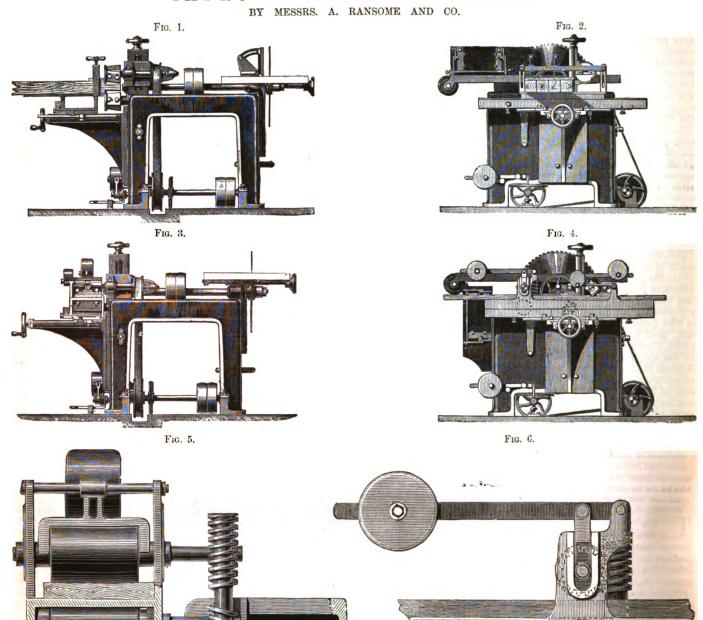
At the same sitting, Mr. Shaw asked the Sccretary of State for War whether the rumoured purchase of Dover House by her Majesty's Government was correct; and, if so, what were the objects for which such purchase had been made.

Mr. Cardwell said it was not true that the lease of Dover House had been purchased by the Crown. But, on the matter to which he understood his hon, friend's question pointed, he had to say that the best mode of placing the War Department and the Horse Guards under the same roof was now under the careful consideration of the Government.

Major Dickson asked the First Lord of the Admiralty if instructions had been given by the Admiralty for the Government moorings in Dover Bay to be examined; and, if so, by whom the duty would be performed.

Mr. Childers said there were two moorings in Dovor Harbour. As the House was aware, on Easter Monday an accident happened to one of

#### IMPROVED GENERAL JOINER.



Majesty's dockyards had been sent down to repair the broken mooring, and the other would

repair the broken mooring, and the other would be examined at the same time.

Mr. Eastwick asked the Postmaster General whether the Bremen Company had made arrange-ments with the Post Office to land the mails from New York at Plymouth. To this the Marquis of Hartington said that the arrangements for the postage of these vessels, including the landing of the mails, was made by the United States Govern-ment, and the Government had not received any intimation of the intention of that Government to

land the mails at Plymouth.

Alderman Lawrence asked the Secretary of State for War whether the expense of twelve or State for War whether the expense of twelve or fifteen hundred pounds a year incurred for storing saltpetre in the docks and private warehouses might not be saved by storing the same in the Government depôts. And, whether he would state what quantity of saltpetre belonging to the Government was at present stored in the docks and private warehouses. Mr. Cardwell agreed

that this would be a judicious piece of economy—so judicious, indeed, that the stores of saltpetre were now in course of removal as his hon. friend suggested, and were now almost all removed.

On Tuesday, Mr. Childers stated that the works at Malta harbour were now nearly completed. He was happy to state that he had been in communi-cation with the Secretary of State for the Colo-nies and the Secretary of State for War, and that they were in a position to send out to the governor of Malta instructions based upon an arrangement which he hoped would preve satisfactory, and would put an end to all the dissensions that had taken place on the subject. By this arrangement the great harbour would be available for merhapt ships and the Transle Coale for the Martin and the Transle for the Martin and the Martin chant ships and the French Creek for her Majesty's

At the same sitting, Mr. Trevelyan moved for and obtained leave to introduce a bill to make better provision respecting Greenwich Hospital, and the application of its revenues, by further ex-tending the system of out-pensions, which had

been found to work well since the changes in 1865. With this view he proposed that only those who required the shelter of an infirmary should be inpensioners, and these should be removed to Haslar and other hospitals, where they would be main-tained out of the funds of the hospital. The tained out of the runds of the hospital. The building now used as an infirmary would be handed over to the trustees of the Dreadnought Hospital; but it had not yet been determined by the Government what use the large structure of Inigo Jones and his successors facing the river should be applied to. Another important part of the scheme was to take out of the workhouses all seamen who had been engaged in the service of the country, and provide for them by small pen-sions out of the funds of the hospital, so that they might be placed beyond the reach of poverty. It was also proposed to pay £4,000 a year to the Board of Trade for division amongst those merchant seamen who might have contributed their monthly sixpence for ten years and upwards to the hospital fund.



### RANSOME'S GENERAL JOINER.

THE compound machine known as the general joiner is the most useful apparatus of which we know in a builder's shop. Its utility is seen in the fact that no shop of any pretension whatever is now to be found without one. But however perfect these machines may have hitherto been considered, it is quite certain that those in general use are capable of considerable improvement. This was made very clear to us by a recent visit to the works of Messrs. A. Ransome and Co. 304, King's-road, Chelsea, where we found the improved machine represented in the annexed engravings. The chief objection which has hitherto been urged against machines of this class is that when the attendant working at one part of the machine has to stop to adjust or change his cutters, all other operations are suspended. This objection has now ceased to exist, inasmuch as in the apparatus under notice the tenoning, planing, and thicknessing, and moulding operations can be carried on without interfering in any way with those that are done at the sawing end of the machine, such as ripping-out, cross-cutting, squaring-up, tongueing and grooving. Figs. 1 and 2 of our engraving are two views of the machine, as our engraving are two views of the machine, as arranged for ripping out and tenoning. Figs. 8 and 4 show the apparatus as set for cross-cutting and planing or moulding. Figs. 5 and 6 are enlarged details; fig. 5 being a section showing the details of the worm feeder, and fig. 6 being a side elevation of the same part. From these latter views the exceedingly nice arrangement for obtaining vertical motion is seen.

By the aid of these engravings and the following observations, the superiority of this machine will be at once apparent. The tenons are formed at one by means of revolving cutters, which finish them much more accurately than they can be finished where saws are employed for this purpose, as is the case in other machines of this class.

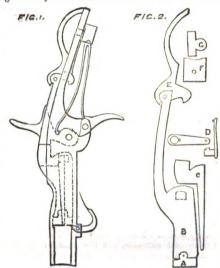
The wood to be tenoned, which may consist of several pieces up to a total width of 18in., is cramped in a horizontal position upon a light sliding plate, instead of each piece being fixed separately in a vertical position, as heretofore. Tenons can be formed with shoulders of unequal lengths, by simply altering the position of one of the tenoning blocks on its spindle. This joiner will plane both sides and thickness, at one operation, boards up to 7in. wide, and will cut single or double moulding of any pattern in any kind of wood, which is quite of any pattern in any kind of wood, which is quite a new feature. The wood being planed is fed through by a pair of revolving feed rollers, both of which are driven, by which means a greatly increased propelling power is obtained, and the rollers, being perfectly smooth, do not indent the wood. In our representation of the machine as arranged for tenoning, the fence is shown at right angles to the table, but it can be readily adjusted to cant at any angle for sawing weather boarding and other bevel work. When the machine is arranged for cross-cutting and planing, the table is raised so as to clear the driving pulleys, the fence being turned over and hanging below the table.

In order to illustrate the practical value of this apparatus, it was set to work and did some moulding and tenoning with such speed, accuracy, and finish, as to place the machine beyond all praise We brought away samples of the work with us, and they are, undoubtedly, the best finished productions of the kind we have ever seen. The topside of the wood was finely moulded, whilst, at the same time, the underside was being planed. In the tenoning, too, a perfect planed tenon was produced at one operation. The advantage of driving both top and bottom rollers cannot be overrated, as in other machines, where the top roller only is driven, it is found necessary to groove it very deeply, in order to give it sufficient propelling power, and thus the board, is, in many cases, very materially injured. It will further be seen, on reference to our detail figures, how the top roller is arranged to rise and fall, so as to suit the irregularities in a rough board; at the same time, it is always exerting its full feeding power. By means of a very simple mechanical arrangement, the rate of feed can at once be varied from 5ft, to 12ft, per minute, whilst the machine is in full work, and the attendant working at this portion of the machine can retard or accelerate the feed, according to the nature of the wood about to pass under the cutters. It may be as well, before concluding, to say a few words respecting the fence. Instead of the long and cumbrous fence, which, in general, is required to carry the tenoning slide, a light fence is substituted, which is arranged to turn over and hang down below the table, thus enabling the machine to be used as a cross-cut saw bench for any length of linear tenoning slide, a light fence is substituted, plied, and tapered into a spring from this shoulder so as to throw the breech plug so far back into its bed as to hold the cartridge in its chamber when laid in Trinity churchyar inserted. Cocking the gun brings all the pieces of side of those of his wife.

stuff, without interfering with the work going on at the other end of the machine. In other joiners, this is impracticable, on account of the difficulty in removing the fence. The operation of changing the machine from one class of work to another is performed in a very short time; in fact, Messrs. Ransome have succeeded in rendering this machine in every respect the most perfect of its kind, and it has afforded us much pleasure to record the successful results of its working.

### THE ROBERTS' BREECH-LOADER.

N the last number of the "American Army and Navy Journal" that has reached us, we find the Anyy Journal that has reached us, we find the following particulars respecting the new breech-loading rifle of General B. S. Roberts, of the United States Army. The principal features of this new arm are nearly identical with his system for the transformation of old muzzle-loading arms into breach loading. The new gun is, more properly speaking, the Roberts system perfected. In making a new gun, the opportunity was offered of applying the mechanical parts of the system, so as to operate the arm with more ease, and to give strength to pieces in a new arrangement that could not, for want of space in the system of transformation, be made of the proportions for necessary solidity and strength for military purposes. General Roberts, as an army officer of nearly two score years' experience, has had unusual opportunities for understanding the kind of arm required for the soldier. He has studied simplicity, solidity, and safety; and has, at the same time, sought to secure the utmost rapidity of fire. He has reduced the operation of loading and firing to four short, quick, and safe motions, and can discharge twenty shots per minute from the shoulder. He has so automatonized the mechanics of his gun that it may almost be said to work it-He has made it so secure against premature discharge, that accidental firing is impossible. He has fewer and stronger pieces than any other breech-loader yet invented. Nine pieces constitute his lock and all the breech-loading plan. Every piece is large and strong, and they work together on articulated joints, avoiding wholly the use of screws and pins, or any other pieces liable to be lost or broken. The plan of the gun is wholly novel-a system of articulated levers, so joined by circular joints as to operate each other, and yet when in position for firing to have all the solidity and strength of a single piece. Fig. 1 of the annexed cut shows the parts assembled whilst in fig. 2 they are seen detached. A is the recoil



plate, B the breech plug, C the firing pin, D the breech plug key, E the lever catch, F the front of the recoil plate, and G a section of same.

Three levers work together, and constitute the entire breech-loading parts. A lever catch holds the lever breech plug in its bed, and is articulated strongly on the rear of the long arm of the plug. The office of this "catch" is to prevent accidental opening of the chamber. Raising it smartly ejects the cartridge shell after firing by a positive strong force taking effect at the short arm of the lever plug. The cartridge ejector is a lever so shaped as to have a strong shoulder, when the force

the breech attachment safely and securely home to their places of firing. The main piece of the breech plug moves in a solid circular shoulder at the base of the barrel, the centre of the shoulder being the exact prolongation of the axis of the gun, so that the force of the gases has no tendency to move the plug out of its solid bed. The front end of this plug, that rests square and solidly against the base of the cartridge, is transversely articulated on the main plug by a circular joint, and has play enough around its transverse axis to allow the plug to fall below the axis of the gun, when the lever is thrown up after firing. Below that axis it draws to the rear, so that the plug has full play from the top of the barrel to the bottom. By this lever system of mechanics all the pieces constituting the breech attachment of this gun are strong and substantial, without a screw or pin, or any small piece to be broken or lost. The articulating plan of joints avoids the use of pins, screws, or any small or weak pieces.

Another advantage of the Roberts gun is that he tapers his chamber its entire length, and manufactures his cartridges with a corresponding taper their entire length. In this way he easily ejects the discharged cartridge shell, and is not delayed in uniform rapidity of fire by the sticking of the discharged cartridge in the chamber. The centrefire cartridge of his system is his own invention, and he has an independent patent both for his car tridges and the machine for tapering them. He uses, too, a new and improved bullet of his own invention, increasing the range, strength, and pre-

cision of fire of this new arm.

Three short and quick motions operate the loading and firing. Throwing up the lever ejects the cartridge shell. Inserting the cartridge and cocking prepares the gun for firing. The gun must be full cocked before the centre firing pin can be brought into place to reach the fulminate. act of cocking the gun, and no other act, can bring the breech plug into its firing position. Premature discharge is impossible. The lock, if lock it ture discharge is impossible. The lock, if lock it can be called, is perhaps the greatest novelty in this arm. It consists of three pieces only, and has neither a screw nor pin to put them together. The cock, the trigger, and a double main-spring of great strength, are the three pieces. The two ends of the double spring are set against and held into the cock and trigger on shoulders, so operating the force of the spring against the cock and trigger that they serve as the "sear" and "tumbler" in the old gun lock. The lock occupies very small space centrally in the rear of the chamber. The cock is slotted through the rear handle of the lever, and its head delivers a strong blow in a direction that forces the firing pin directly forward, insuring unerring certainty of The gun stock is uninterrupted in its entire length, and is in no place weakened by being cut to insert pieces of metal, and has but two screws that penetrate it for any purpose.

# THE INSTITUTION OF CIVIL ENGINEERS.

ON Tuesday last the members and associates of the Institution of Civil E the Institution of Civil Engineers and their friends dined together at Willis's Rooms, St. James. The president, Mr. C. H. Gregory, occupied the chair. Amongst the company, which numbered about 300, were the following:—The Duke of Buckingham, Viscount Stratford de Redeliffe, Lord Houghton, Lord Lawrence, Lord W. Lennox, Lord Alfred Churchill, Viscount Bury, M.P., Lord Richard Grosvenor, M.P., the First Lord of the Admiralty, Field Marshal Sir John Burgoyne, General the Hon. James Lindsay, Baron Bramwell, the Astronomer Royal, Professor Owen, the Presidents of the Royal Academy, Astronomical and Chemical Societies, and Institute of British Architects, &c. The Duke of Buckingham, in giving "Prosperity to the Institution of Civil Engineers," coupled with it the name of the senior past president present, Mr. Bidder, paid a high though deserved tribute to the value of the services of the civil engineers. They had promoted trade and commerce everywhere, and had done more to advance the happiness, prosperity, and convenience of mankind than any other body of men that ever lived. Mr. Bidder briefly returned thanks. Amongst the other speakers during the evening were Lord Stratford de Redeliffe, Lord Lawrence, Lord Houghton, Baron Bramwell, Lord Bury, &c.

THE funeral of Sir Edward Cunard was solemnized at New York, on the 10th inst., and his remains were laid in Trinity churchyard, New York city, by the



# ALPHABETIC TELEGRAPH. MAGNETO-ELECTRIC BY M. BREGUET.

Frg. 1.

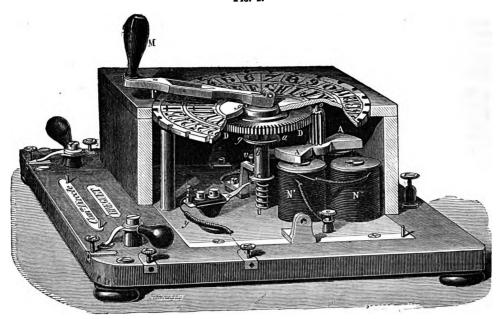
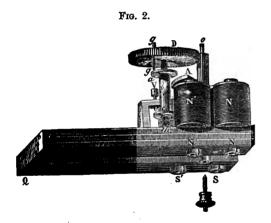
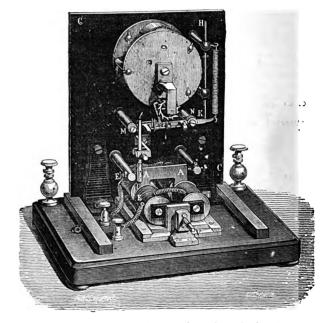


Fig. 3.





## MAGNETO-ELECTRIC ALPHABETIC TELEGRAPH.

THIS instrument will, at the first glance at our Hills instrument will, at the first glance at our illustrations, strike the observer as being similar to Brequet's ordinary alphabetic telegraph; but a little closer studying will show that the source employed for working the instrument is, in the present case, magneto-electricity, whilst, in Brequet's ordinary telegraph, voltaic electricity is used as the electro-motor. This instrument was arbitisted at the Davis Tabilities returned to writed used as the electro-motor. This instrument was exhibited at the Paris Exhibition, where it excited some attention. It is known as "Guillot's system," but the general arrangement and details are mostly the same as in Berguet's, the favourite French railway instrument. The system consists of two parts, the "manipulator" or sending key, and the "receiver" or alphabetic dial. The sending key is very easy for manipulation, owing to the simplicity of its mechanism and to the peculiar fea-tures which it presents. Fig. 1 of our engraving shows a general view of the manipulator. Fig. 2 shows a general view of the manipulator. Fig. 2 shows the peculiar arrangement of magnets and armatures. In the pedestal of the instrument is fixed a permanent magnet, consisting of three superposed magnets screwed together, fig. 2. Upon the extremities of the poles of the magnet are placed cylindrical cores of soft iron, carrying four wooden bobbins wound with insulated wire. These contents of a second content of the cont

true square. An armature A A turns on its centre o, which, at the same time, is the centre of the square. So situated, the soft iron cores become magnetized, and each time that the armature passos from one diagonal to another of the square, currents are produced in the four bobbins. Two of these currents are produced by the removal of the armature from the "core;" and the other two by its approach. The first are much stronger than its approach. The first are much stronger than the second currents, but the sum of the whole four is always equal, and this sum is obtained by conveniently uniting the extremities of the wires of the four bobbins so as to form only one circuit. When the armature passes from a diagonal position N S 1 to another N 1 S 1, the current produced is in one direction or sign. When the armature continues its movement and passes to the position S¹N, a second current is produced of the contrary sign to the first, because the first current was due to the "removal" of the armature from the bobbins N and S¹, and of "approach" to those of S and N¹; whilst, in the second case, the opposite positions would be the case; or, in other words, the two removals of the armature in one position correspond to the two approaches in the other.

The movement of the armature is obtained by means of a pinion of 20 teeth geared into a wheel of 120 teeth, D, on the axis of which is fixed the

of a revolution; so that, when the handle passes from one letter A to the succeeding one B, a current is sent of one sign. When the handle passes to the next letter from B to C, a second current is to the next letter from B to C, a second current is sent of the opposite sign, so that, by the present key, a current is sent for every letter; for one half the currents will be of one sign, and for the other half of the opposite sign. The manipulation of the key is not interfered with by the peculiar magnetic attractions and repulsions that take place between the armature and the four bobbins; and from experience it is found that very little more force is required to keep turning the handle than

in the ordinary manipulator.

The arrangement in the key for sending and recoiving are somewhat novel, and very simple. So long as the handle is raised, as in the position in fig. 2, so long is the communication established between the line and the bobbins, and by turning the handle, the currents induced are sent entirely into the line without the possibility of any loss. When the handle is depressed by dropping the pin under the handle into any one of the notches on the outer circumference of the manipulator, the com-munication between the line and the bobbins is broken, and the line is thrown into connection with the receiving instrument, and each time that this is done, the sender can be interrupted by his correwooden bobbins wound with insulated wire. These cores N N 1 S S 1 are placed at the four angles of a 1-26th of a revolution, the armature makes 1-4th place in whatever position the depressed sending



key may be. The object of this disposition is to prevent the loss of any part of the current, in consequence of the fault of any of the current, in consequence of the fault of any of the contacts, &c. This result is obtained by means of a commutator carried in the axis of the manipulator, and capable of an upward and downward movement between two fixed circuits. This cylinder or bobbin ab c communicates with the mass of the apparatus and with the line; when it is in its lower position, it presses against the spring U, which communicates with the receiving instrument; when in its upper position, the spring U forces it up against the screw v, which communicates with the bobbins of the manipulator, so that in this position, currents are sent direct into the line. The commutator ab c is maintained against the screw by the spring U, but, on the other hand, it is pressed downwards by a pin g passing through the axis which is pressed against the upper surface of a by means of the handle M. So that it will be seen in ordinary sending, on turning the handle round, a current will be induced, and sent into the line for each letter. When it is required to signal any letter, the handle is dropped into the notch corresponding to the latter, and in this position, the line is commutated to the receiving instrument; the weight of the handle is sufficient to maintain the commutator in its lower position. On lifting up the handle, the bobbins are once more in communication with the

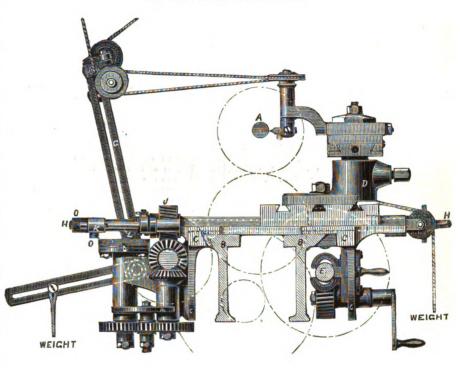
For working with this manipulator, a difference in the receiving instrument was necessary. In the ordinary alphabetic instruments they received with a current of only one sign, but the present key transmits currents of alternate signs, and it was necessary to have a needle advancing a letter for each current sent, no matter the sign. Fig. 3 shows a magnetized horse-shoe armature A A placed between two electro-magnets E E !, which are placed so as to have their opposite poles to each other, so that when a current passes through E, the armature is attracted by it, and repelled by E !. A current of an opposite sign will produce contrary results. Every current, therefore, will effect a movement in the armature, first in one direction, then in the other; the armature being without a spring, remains always in the last position when attracted: it remains so until a current of an opposite nature is passed. Each time a current is sent from the manipulator, the armature is attracted, and the motion is communicated to a detent, which allows the escapement wheel to advance one step, and, consequently, the needle to advance from one letter on the dial to the succeeding. This receiving instrument never requires regulating, because the two successive movements are always equal; it is sufficient that the current received should always possess an intensity superior to a certain minimum, so that the working of the instrument will be certain. These instruments are manufactured by MM. Buguet, of Paris, and have now been at work on some lines in France for some time, and they have given every satisfaction.

# SLIDE REST FOR TURNING IRREGULAR SECTIONS.

In our impression for August 14 last year we reviewed a very useful work upon "Lathes and Turning," by Mr. W. H. Northcott. The author of that book has since worked out a highly ingenious piece of mechanism for turning irregular forms, which we illustrate herewith. This system differs from the Blanshard and other lathes, inasmuch as it is applicable to ordinary slide and screw cutting purposes in addition to its capability of turning irregular forms. A is the centre line of lathe spindle, B is the lathe bed which carries a pair of ordinary headstocks, C is the saddle of the slide rest caused to travel along the bed by means of the leading screw E, D is a rest holder bolted to the surfacing slide, and is shown carrying an ordinary short slide with Willis's holder and a light fly cutter. This or other cutter is driven from overhead by means of a cord or gut which is kept strained in every position of the slide by means of the lever G. The shaft F and the leading screw E are driven from the lathe spindle by suitable change wheels, but generally the shaft F has to run at the same speed as the lathe spindle. The surfacing slide carrying D is caused to move across the saddle by means of the screw H, either by a handle in front or automatically by the worm wheel I driven from a worm on the shaft F, the motion of the screw by means of a sliding clutch. The surfacing screw H is continued past the worm wheel and clutch, and at its end is fitted with bearing and

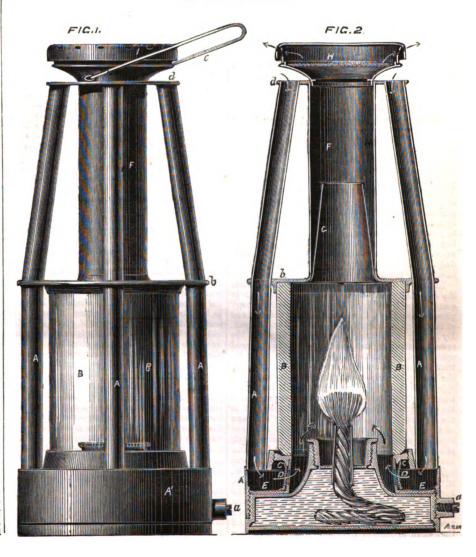
# IMPROVED SLIDE REST.

BY MR. W. H. NORTHCOTT.



# SAFETY MINER'S LAMP.

BY MR. T. GRAY.



adjusting nuts for running in the crosshead K, which crosshead slides on guides L, one each side of the traverse screw.

The shaft F carries a small wrought-iron mitre wheel which rotates with the shaft, but by sliding along it is enabled to follow the saddle anywhere on the bed. This mitre wheel gears with a similar mitre wheel below it, attached to a short vertical spindle, having its bearings in a casting fastened to the saddle. At the lower end of this spindle is a spur wheel, one of a series of changes, any of which may be used to obtain the required There is also another longer vertical speeds. spindle which rotates in a boss forming part of the same frame. This spindle also takes a change wheel, which is driven either directly from the wheel on the other spindle, or through intermethe long spindle has a large collar or disc, to which is fastened another disc. is fastened another disc or receiving plate N. The fastening is made by two bolts with T heads fitting into a circular dovetail groove in the top plate, and passing through the collar below. of one plate is graduated, and the other is furnished with a pointer, so the top plate may be moved round any distance, and then fastened by tightening the nuts below. The top plate has a number of screwed holes to allow of fastening various shaper plates to it. The sliding crosshead K carries a suitable rubber O placed just below the bearing of the screw H, and the shape of this rubber depends upon the shape of the copy plate. The surface screw H has its usual bearings in the metal of the saddle, but the collars to the front bearing are formed by four nuts (shown dotted) which allow of any end play being taken up. The inside pair of nuts, however, must be screwed back when the irregular turning mechanism is in use. as the screw H has to slide lengthwise through its bearings.

On the lathe being started, the mitre wheel drives the short vertical spindle, and this motion is communicated by the change wheels to the copy plate attached to the top of the second verti-The shaper plate, in rotating, being pressed against by the rubber O, causes the cross head K and screw H to reciprocate, or slide end-ways in its bearings, and this motion is of course partaken of by the slide and tools carried by the slide. The rubber is kept in contact with the copy plate by a weight attached to the slide, and passing over a small pulley in front, so that the surfacing slide may still be moved by turning its screw, and the pressure upon the copy plate is not affected by the position or movement of the slide. When using the mechanism, the surfacing slide should be well oiled and made to slide freely, as then less weight will suffice to keep the rubber against the copy. The shape of the copy plate is against the copy. not difficult to determine, as any copy will either produce its counterpart or its inverted profile according to the position of the tool's point relative to the centre of the work. The best plan for ascertaining the shape of the plates is by means of a diagram. With an eccentric circle for the copy plate, a variety of forms can be produced. The eccentric will produce an eccentric with the tool's point either side of the lathe centre, but a slight alteration of its position will alter the figure. Whatever figure the copy has been shaped to produce on a surface, it is obvious that, by moving the tool along the lathe bed in the usual manner, a long shaft of the same section is pro-duced, and the shaft can be made to taper just as in ordinary turning.

In most of these applications of the mechanism, the copy and work make equal rotations, but, in some cases, it is more convenient for the copy plate to rotate two, three, four or more times to one of the work, as a simpler copy may then be used. By having a very slight difference between the speeds of the copy and work, the work is rendered spiral, that is, whatever shape its section may be, that shape continually changes its position. If the copy plate rotates faster than the work, the spiral is left-handed; if slower, it will be righthanded. The pitch of the spiral will depend upon the relative speeds of copy, work, and tool, and is the distance travelled by the tool during one turn of the spiral. These spiral forms are rendered tapering in the usual manner, and secondary spirals of any pitch can be cut upon them. The irregular shape mechanism is very usefully applied to turning cams, the cutting tools depending, of course, upon the shape to be produced; but, as a rule, revolving cutters are to be preferred, as the lathe may then be driven slowly. Curved slots and

only have to be turned, the work and copy plate generally make equal rotations, and, when the position of the section has to vary, there must be some slight difference between their speeds. giving the copy a very slow motion compared with the work, instead of the article having an irregular transverse section, it is turned circular, but of irregular longitudinal section. For instance, by having a copy plate formed of a true spiral, tapering shafts are produced. Having an eccentric circle for the copy, and rotating it very slowly compared with the work, the work is circular in section, and is formed longitudinally of a series of alternating internal and external curves. shape is produced automatically, and may be rendered tapering; or a spiral of any pitch may be cut upon it just as easily as upon a cylinder.

The practical applications of Mr. Northcott's mechanism are both useful and various. The curves of connecting rods are very readily produced by an eccentric circle copy plate. curved faces of belt pulleys can also be produced and given to one or to any number on shaft by the repeated rotations of a small eccentric plate. The drawing rollers of spinning machinery, handles of starting levers, bolts with countersunk heads, and many other articles frequently required in large numbers, can also be produced from suitably formed copy-plates; whilst, for cabinet making and for ornamental turning, the applications of the mechanism are almost endless.

### GRAY'S SAFETY MINER'S LAMP.

THE recent deplorable accidents in mines would A appear to have stimulated the inventive talent of the country to further attempts to produce a miner's lamp, which should really deserve the title of "safety." We recently noticed one invention for this purpose, and we now place before our readers another, which equally merits the attention of those who are interested in preventing these fatal catastrophes. It is the patented invention of Mr. Thomas Gray, mining engineer, of Taibach, Glamorgan, and in it the "poles," which in other safety lamps support and keep together the different parts, are hollow, for the purpose of supplying the flame with the necessary oxygen to support combustion. These hollow or tubular poles connect the extreme top and bottom of the lamp; at the bottom they are screwed into a chamber, in which the air, after passing down the poles, circulates, and in which there is a ring of wire gauze, through which the air passes to the flame. From the flame the heated air and products of combustion ascend the ordinary glass cylinder and a metal chimney placed in the wire gauze cylinder. The wire gauze ring prevents the return up the hollow poles of the ignited gas, while the lamp is surrounded by, or is being used to detect the presence of, inflammable gas. A cap prevents dust entering the top of the hollow poles.

Fig. 1 of the accompanying engraving is an elevation of a safety lamp fitted with Mr. Gray's improvements, and fig. 2 is a sectional elevation of the same. A A are the hollow poles, secured at the bottom to the upper part of the gallery A 1 of the lamp. This portion of the gallery forms an air-distributing chamber, by which the air which passes down the hollow poles becomes equally distributed over the whole area of the chamber. D is the vertical ring of wire gauze, through which the air passes to the flame, dicated by the arrows, and which prevents any ignited mixture of gas from communicating with the explosive atmosphere in which the lamp may This ring D of wire gauze is sustained in be. position by a washer E, part of which is vertical, and part bears on its outside edge a screw thread. by which it is screwed to the chamber. The ver-tical part has apertures for the passage of air at intervals. A part of this washer E, marked C, screws up into a projecting flange of the chamber or gallery, and retains the glass cylinder B in its place. This part, C, of the washer, has on its place. under side a projection, which serves as a guide for the washer E, when being screwed, and keeps the wire gauze ring in its place. These two washers, therefore, when screwed into place, are combined, and support the vertical ring of wire gauze, and all the air which the flame requires must pass through it.

The body or oil reservoir of the lamp is screwed up into the lower portion of the gallery, and is firmly held in place by a tightening screw a. The flange O supports the glass cylinder B. The glass apertures, through which the hollow poles pass, and by which they are held in place and steadied. The upper end of the chimney is spread out, and carries a wire gauze disc H, through which the products of combustion pass. Over this disc gauze is placed a cap, made with apertures for the passage of the heated air and smoke, and in such that when the lamp is in any current of air, the flame burns uniformly and is not affected thereby. The tops of the hollow poles are attached to a flange d, to which the handle or loop e, by which the lamp is carried, is fastened.

Mr. Gray sometimes fits into the neck of the

a cone or tapered tube G, by which the draft of air supplied to the flame is governed. A cap can be placed over the tops of the poles when necessary to prevent dust entering them.

The advantages of this lamp are that it will not burn in an explosive mixture of gas and air, the quantity of air in consequence of sufficient to support combustion, so that when the lamp is placed in gas it is brought down the air the exclusion of the necessary quantity of air, and the light is extinguished. It will not, when exposed to currents of explosive mixtures, By the air being admitted at the flame. top of the lamp, the smallest quantity of gas which may be near the roof of the mine is detected, by being brought down the air tubes into direct contact with the flame. By the small quantity of gauze used, the danger of the lamp being injured by the workmen's tools, or falling stones or coals, is much lessened.

COMPARISON BETWEEN THE WHITWORTH POLYGONAL AND THE WOOLWICH STUDDED PROJECTILES.

BY MR. JOSEPH WHITWORTH, C.E., F.R.S., &c.

UNDER the above heading we have a very U suggestive paper from the pen of Mr. Whitworth, and one which will be perused with interest by all our readers. In this paper Whitworth projectiles cast with rifled polygonal surfaces are compared with Woolwich projectiles, with dove-tailed recesses for the insertion of soft metal studs to give rotation. The subject is treated under three heads:—1. Simplicity and economy of production. 2. Area of bearing sur-3. Centring of the shot in the bore of the faces.

## 1. SIMPLICITY AND ECONOMY OF PRODUCTION.

Polygonal.-Projectiles for field guns are fired as they are cast, just as in the case of smooth bores. For large guns, they are planed or shaped, one machine only being required. The time occupied in rifling a 9-inch shell, weighing 300lb., is only twelve minutes. In studded projectiles the body of the shot has to be cast with recesses for the studs, or they have to be drilled in, and recessed with cutters. In either case these recesses are a source of weakness, rendering the shell liable to break up in the bore of the gun. The 9-inch projectile has 12 stude inserted in it, by pressure, each one requiring attention; there are also six different surfaces to attend to, viz:—The body of the shot, the outer circumferences of the studs, the right and left sides of the rear studs, and the right and left sides of the front studs, which are made narrower than the rear studs, on account of the increasing pitch. The projectile for field guns has six brass studs fitted into it.

Studded projectiles have in their manufacture to pass through several workmen's hands, and costly machines have to be employed, viz:-lathes or grinding machines, drilling and punching machines, in addition to the rifling The cost of wages for the large projectiles is many times greater than for those of the polygonal system; the cost of the metal for stude is considerable; and to this must be added the cost of a packing case or thick canvas bag for each projectile, on account of the soft metal studs being liable to injury if one projectile is allowed to rest upon or knock against another. In the penetration of armour plates the stude are an obstruction, and the power required to shear them off is so much deducted from the force of the projectile.

# 2. AREA OF BEARING SURFACES.

For a 9-inch polygonal projectile, the rifled surfaces which both support and rotate the shot have an area of 187in. The 12 stude of a 9-inch Palliser projectile have a circumferential area of 18in. for supporting the shot, but the area of the grooves are also easily and automatically cut by means of this mechanism. It will be understood that when articles of irregular transverse section metal chimney F. This flange is provided with motion is given, is only 1-6inch. No practical



engineer would think of providing so small a surface to give even a small amount of rotation to a body weighing 250lb., much less when the rotation of the shot at the muzzle of the gun has to be at the rate of about 2,400 revolutions per minute. The increasing pitch which has been adopted prevents the use of more than one stud in each groove for giving rotation. This varying curve is groove for giving rotation. This varying curve is the worst possible mode of imparting rotation, for each rear stud can only bear against the side of the groove of the gun on a line of its surface, on account of the ever varying curve, except by excessive pressure, which jams and distorts the soft metal, and occasions liability to accident. The greater the amount of windage, the greater will be the liability to accident.

# 3. CENTRING OF THE SHOT IN THE BORE.

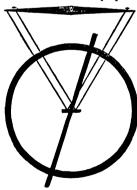
In starting, the polygonal projectile centres itself, so that its axis coincides with the axis of the gun, and it is propelled through the bore with a steady equable motion. The studded projectile in starting does not rise and centre itself parallel with the axis of the bore, but lies on the bottom; consequently, the gases and unconsumed powder pass sequently, the gases and unconsumed powder pass over the projectile, causing excessive scoring, and tending to keep the shot down, thus giving increased pressure to the outer surfaces of the stude, particularly those of the rear, and adding to the irregular and vibratory motion as it is propelled through the bore, and the greater the windage, the more unsteady will be the motion.

Following the foregoing is a short paper, by the same author, on the proof of guns, which we reserve for next week.

reserve for next week.

### THE DIP CIRCLE.

A T a recent meeting of the Manchester Literary and Philosophical Society Dr. Jones F.P.S. A and Philosophical Society, Dr. Joule, F.R.S., gave an account of his endeavours to improve the instrument known as the dip circle, which, notwithstanding what had been done by Lloyd and others, was not comparable in delicacy to the decli-The ordinary mode of causing the axis of the needle to roll on agate planes first claimed attention. He found it possible to obtain a steel cylinder of beautiful accuracy as follows :- A steel wire, stretched by a weight hanging from one ex-tremity, being heated to redness, draws out a cer-tain length, and in so doing becomes perfectly straight. The wire is then divided into pieces each about 2in. long, which are ground true and then polished by rolling them against one another. If the operation has been carefully conducted, one one wire laid across two others will roll noiselessly down an almost imperceptible gradient. The plan of suspension thus indicated appeared better than the use of agate planes, inasmuch as dust and moisture were less likely to interfere with the delicacy of the indications. Nevertheless, it was impossible attogether to avoid the effects of these impediments to free rotation, and the more so as the obstruction to rotation is proportional to the



square root of the height of any small particle between the rolling surfaces. In fact, on narrowly watching the periods of oscillation, they were invariably found to become sensibly quicker when the arc was very small, showing that the needle was rocking on two points. The suspension by inclined silk threads was then tried, but soon abandoned, as it was found that the violent torsion at the points of attachment could not be certainly

allowed for, owing to the viscosity of the threads.

The system brought now before the Society was The system brought now before the Society was free from the above-named evils. It is illustrated in the accompanying sketch. In it each end of the axis of the needle is suspended by a fibre of silk, on which it rolls. Small washers on the axis serve to keep the fibres in a definite position. The ends of the fibres are supported by the extremities

of a delicate balance beam, placed at the top of the instrument. Small pins, &c., are used for adjusting the length of the fibres and to regulate the centre of gravity of the beam. The needle itself is a piece of softened watch main spring, sufficiently long to extend completely across the graduated circle. It is 7in. long and weighs eighteen grains. A glass plate fastens before the instrument by a notch. By the reflection of the eye of the observer from this glass parallax is avoided, while the position of each edge of the needle is read off by an eye-glass to a minute of arc. There is no difficulty in adapting the reflecting system for the purpose of registering minute magnetic disturbances.

### THE DURABLE COMPOSITION INKING ROLLER.

T is a matter of the first importance with printers that they should always find their inking rollers in a proper condition to do good work. This the ordinary glue and molasses rollers very rarely are; besides which, they have a tendency to dry, shrink, and crack, after a short term of working, requiring constant attention and renewal. A material, therefore, which does not require continued looking after, which remains moist, and which, moreover can be recast in case of injury to its surface, will prove a boon to the printing trade. Such a composition has long been sought for, and now appears to have been found in the patent inking rollers of Messrs. Lawrence Brothers, of 22, Basinghall-street, London. This composition is a mixture of glue, glycerine, sugar, and other saccharine matters, soap, and fixed oils, in combination and proportions variable according to temperature, climate, and destined uses. About three months since, we received one of these composition rollers from Messres. Lawrence, and at once handed it over to our printers to make the best and worst use they could On enquiring, the other day, we found the roller to be in just as good condition as it was on the day it was first used. There was no shrinkage, cracking, nor hardening in the cold mornings, nor any other inconvenience incidental to the ordinary printing rollers. On the other hand, we find that the composition roller never loses suction, does not require washing at the end of the day's work, is not affected by heat, and is, in fact, as perfect a printing roller as could be wished. The success of this roller in our hands shows it to be a composition which must rapidly find favour with the printing fraternity wherever it is known.

# GAS IN SINGAPORE.

THE annual general meeting of the Singapore Gas Company was held last Tuesday, and the report of the directors then presented, show a profit of £1,267 for the half-year. From the engineer's report, we learn that Labuan and Australian coals work well togother. For the half-year—gas produced 2,090 cubic feet per ton; gas paid for 8,220 cubic feet; lost or deficiency, including the consumption on the works, 92 per cent. The oxide of iron and ammoniacal liquor process for purifying continues to work well without the of lime, and the original oxide is still at k. The new Government House is ordered aid work. work. The new Government House is ordered to be lighted, and an estimate has also been sent in for the lighting of the General Hospital; should this be carried out, three public lamps in addition will be placed on that line of road. For the supply to Government House, a main will have to be taken from Selegie-road, across the Princeps Estate, which will give the Europeans in that vicinity an opportunity of taking gas. One house is fitted up and another ordered. The main laying has been commenced. We are glad to observe that the prospects of this enterprise continue to be encouraging.

# THE CHANNEL BRIDGE.

THE CHANNEL BRIDGE.

THE following is a translation of a paragraph in the "Journal Officiel del'Empire Francais" of the 16th inst:—"The project of a bridge over the straits makes each day further progress. The first model was completely finished some days ago, and is perfectly satisfactory. This small model is composed of a single arch, reduced upon an exact scale to the hundredth part of the size of one of those of the great bridge. It presents an absolute rigidity thoughout, that is to say, it is not subject to any movement or oscillation; there is, consequently, no vibration calculated to disintegrate the metal. There is no more elasticity perceptible under foot than in walking on a pavement, and it can support without any defice-

tion, a weight greater than twenty trains proportioned to the same scale, meeting in the middle of the arch. The weight of ten men does not produce a deflection of more than a few millimetres in its whole length, and as soon as it is relieved of its burden, it recovers exactly its first position—indeed, it was not necessary to employ several of the parts prepared to insure rigidity. This result simplifies the question, and permits considerable economy in the cost. A second model of a size double that of the first is on the point of being completed, and, if, as everything tends to show, the result is as favourable, the most sceptical will be unable to entertain the smallest doubt in respect of it. In any case, the problem is resolved that bridges and viaducts of every size can be constructed in a single arch without piers from bank to bank. Already, many orders for large and small bridges have been given; among others, a large bridge with a road and railway of a kilometre in length, which will unite St. Male and St. Servan to Dinard, a foot bridge of 100 metres over the basin of the loch at Calais, and several others for the departments." at Calais, and several others for the departments.

# ON VENTILATION. By Dr. Edward Smith, F.R.S.

PART III.-CONCLUSIONS. (Concluded from page 281.)

T now remains for me to state summarily the con-

Thow remains for me to state summarily the conclusions to which a consideration of the subject
and my official experience have led me.

1. Interchange of air which proceeds both by
diffusion and removal is not instantaneous. The
rapidity of interchange varies with many circumstances.

stances.

2. The effects of any natural system of ventilation vary with the season as well as with the special conditions of a building and the number of inmates.

3. There is a relation between ventilation and temperature, which in reference to inhabited rooms

is generally an inverse one, and as the human body requires a temperature of the air of from 55deg. to

requires a temperature of the air of from 55deg. to 65deg. according to the season, ventilation in cold weather must be restricted by the lower, and in hot weather by the higher temperature.

4. The movement of the air, although so essential to health, must not be very perceptible, lest it should cause discomfort and disease. Hence the inlets and outlets must not be very near to the inmates, and the current must be divided.

5. The ventilation should, if possible, be self-acting after the amount required in a given room and under given conditions has been fixed.

6. Any general rule which may be laid down as to the number and size of the ventilators required in a room will demand modification by experience, since

room will demand modification by experience, since the admission of air will depend upon the elevation of the site, the direction of the prevalent winds, and the impediments which surrounding walls and buildings offer, and these cannot be the same on all

buildings offer, and these cannot be the same on all sides of a building.

7. Some differences in the plan, and much in the extent to which the plan should be carried, must depend upon the use of the rooms and the destination of the building, as to whether it be a private house, a public building with a fixed number of occupants, or a building, as a theatre, with a very varying number.

occupants, or a building, as a theatre, with a very varying number.

8. There is a relation between space and ventilation, for it is evident that with defective ventilation (not entire absence of ventilation) the larger the quantity of air in relation to the number of occupants the less the immediate evil, whilst at the same time, the larger the mass of air to be moved the greater is the force, or the more extended are the means, required to move it. In private houses, the cost is often unimportant, but in general, and particularly in reference to workhouses, hospitals, and other charities supported by voluntary contributions, the aim should be, by providing the best ventilation, to reduce space to the strict requirements of the occupants, and thus to utilize in the greatest degree the money to be expended. That relation must be determined by experiment. Both architects and amateurs are apt to give undue weight to the lofty, spacious, and handsome appearance of their buildings and too little to the solution of the problem of fitness with economy.

and too little to the solution of the problem of fitness with economy.

9. The test cannot be the life or death of the inmates, for health may be failing long before it ceases. Moreover, there are various degrees of health, and each person has a separate aspect of health, and it is not at all easy to indicate in particular cases the first period when some injury may have been done to it. A test is required by which we may infer that injury would result if the cause were continued, and this must clearly be derived from observation. A close-smelling or a foul-smelling room may not be immediately injurious to health, but it is disagreeable at the least, and as such should not be allowed; and although the most injurious emanations from the body are not offensive to the smell, their emission is accompanied by the injurious emanations from the body are not offensive to the smell, their emission is accompanied by the emission of offensive odours, and the two will coexist. There is thus a relation between them which may be made useful as a test, so that if in an inhabited room the air be foul to the sense of smell it may be regarded as injurious to health. But the

degree of relationship is not exact, since an unnegree or reasonsmp is not exact, since an incleanly person, or even a cleanly one, having the peculiarity of emitting strong odours in an unusual degree, will cause the air to be foul almost as soon as he enters, whilst another cleanly person may stay some time in the same room before rendering it offensive. Homes in realize the action to stay some time in the same room before rendering it offensive. Hence, in making the estimate, we must strive to ascertain whether the foul smell proceeds from dirty clothes, and particularly dirty stockings and unwashed skins, or is simply that which occurs with cleanly persons. When there is no offensive smell it may be assumed that the ventilation is sufficient; but as a certain amount of want of freshness, or closeness, is found in our bedrooms or other rooms without known injury to health. I am of rooms without known injury to health, I am of opinion that the ventilation is sufficient when the air, after the night's use, is not more offensive than is found in an ordinary private bedroom of the middle classes. Absolute purity of air in inhabited places, whether rooms, houses, public buildings, courts, streets, or towns, however desirable, is not necessary

to health, and is not attainable.

10. The test cannot be the means provided to 10. The test cannot be the means provided to effect the passage of a given quantity of air through a room in a given time, for if the ventilation depends upon natural agencies, it will vary with the force and direction of the winds, the impediments to their action upon a particular ventilator, the frequency with which doors are opened, and other varying causes. If the room went closed, except at parcauses. If the room were closed, except at particular places, and the air were, by artificial means, conveyed through apertures at a known rate, it would be possible. We do not, however, live in closed boxes, and we cannot separate ourselves from

closed boxes, and we cannot separate ourselves from the influence of natural causes.

11. Where persons do not occupy the same room or rooms throughout the 24 hours, but use other rooms, and particularly spend much time in the open air, defective ventilation of those rooms will be less injurious in proportion as they are used for a shorter region of time. period of time.

12. The cost of ventilating buildings is usually of importance. None can be so little as that mode which introduces the external air directly, but with proper safeguards, whilst all artificial systems are

expensive.

13. No system can be efficient, in a public institution, which depends upon windows, doors, and fire-places alone; but for thoroughly renewing the air on fitting occasions, it is desirable that there be fitting occasions, windows on both sides of a room, and particularly in

windows on both sides of a room, and particularly in public buildings.

14. When air is introduced on one side of a room only, whether by windows or by ventilators, the extent of its influence will vary with the conditions already named, but there is a relation also between it and the width of the room in reference to satisfactory ventilation. It is evident that, with little force of wind, the air will penetrate into the room but little, and with creater force the more; and also that, with and with greater force the more; and also that, with and with greater force one more; and any that, with a given force of current, the narrower the room the more certainly will it traverse it, and the wider the more certainly will it not traverse it. Hence, with such an arrangement, a wide room will be less perfectly ventilated than a narrow one, and a point perfectly ventilated than a narrow one, and a point may be readily reached at which the influence of such means of ventilation will be nil. Rooms with windows or ventilators on one side only should be very narrow, and still more so if there be no ventilation apart from the windows. A wide room, with windows only on one side, and no special ventilators which act permanently, must be ill-ventilated and unhealthy, as has been shown in the Nightingale Ward of King's College Hospital.

15. When air is introduced on two opposite sides of a room by windows or special ventilators, the current will usually extend further than twice the length of the current from one side of a room, and, as the wind will usually act upon one or the other as the wind will usually act upon one or the other side, the current will have greater force than with air openings on one side only. But there is a limit to the width of rooms so arranged, for, as the current must not be too great to be borne by those inmates who are placed near the external walls, its power to traverse the inner space is restricted. In very wide wards the ventilation in the middle is not so estimates.

so satisfactory as that near the external walls.

16. Where air is introduced into the centre floor of the room a current is produced in the part over which the inmates pass and repass, and is, therefore, very perceptible. Cold air in considerable quantity can rarely be introduced with propriety in that position, but warmed air might be borne.

Each room should be so constructed that its ventilation may be independent of that of staircase ventilation may be independent of that of staircases or any other room, but where two rooms are placed side by side with a partition wall between them, each having windows on one side only, the ventilation of each is improved in proportion as a part of the partition wall is removed. Thus, one room may improve the ventilation of the other, and both be as if they had windows, or ventilators, on both sides.

18. Ventilators should be placed on opposite sides of a room, be of small size, sufficiently numerous to affect all parts of the room, defended on the inside by finely perforated zinc, and be placed at the floor level and ceiling level.

19. Ventilators in a small part of a room only are insufficient for ventilation, since when a current of

goes in a direct line, and does not greatly mix with the air on either side of it. This may be readily seen when smoke is admitted by an inlet and emitted by an outlet ventilator, or such an arrangement as exists in prison cells.

exists in prison cens.

20. Where the conditions rapidly vary, as in churches, chapels, and theatres, it is impossible to devise a system which will not require modification devise a system which will not require modification by an intelligent person. At present, the system is universally defective, and only after the heat has become great and the persons very sensitive to cold are the doors or windows opened. The aim should be to regulate the admission of air from the moment when persons enter, so that the temperature shall never be materially increased, but remain at, say, at before, in winter, and 62deg. in summer. Cool air, without draughts, is better borne than hot air with intermittent draughts. In very lofty rooms the apertures for the admission and emission of air should be below the top, not too far removed from the occu-pants of the seats, the sources of the heat. In addition to this, however, ventilators should be placed in various parts of the ceiling, and be kept under con-

various parts of the ceiling, and be kept under control by a competent person.

21. Such rooms should be thoroughly aired after every occasion of their use, by the full opening of windows. At present, with three services at a church or chapel, this is neglected, and the air is close, heavy, and foul in the afterneon and evening.

22. No artificial means of ventilation should be relied upon solely, which will not act by day and night throughout the year. Hence, with ventilating stoves, which are very valuable, and ventilating air-flues, there should be other and self-acting means of ventilation. of ventilation.

In conclusion, it may be useful that I should sum up the principal errors into which architects are now falling in the systems of ventilation which they recommend. They are:—

1. In not duly estimating the practical limits of the law, that heated air ascends, and the relation of

numbers of inmates and size of rooms in the application of the law.

2. In not duly considering that air shafts, acting under that law, cannot act in all seasons, and with and without fire alike.

3. In not duly estimating the amount of air which can be admitted by windows and doors alone.

4. In not duly estimating the practical limits to which an entering current may be carried, whether

from one or both sides of a room.
5. In not duly considering the effects of currents upon inmates, and the limitation thus demanded upon the amount, force, and elevation of currents.

6. In not duly estimating the inverse relation of

ventilation to temperature in its effect upon inmates, and particularly upon the old and the young.

7. In not duly estimating the influence of the winds, and the impediments of surrounding buildings, &c., upon each aspect of a building.

8. In having incorrect views as to the direction

of the current through ventilators at different eleva-

# FIRE TELEGRAPHY.

THE systems of fire telegraphy now in use in THE systems of fire telegraphy now in use in Boston, Chicago, Cincinnati, St. Louis, New Orleans, Philadelphia, Baltimore, and other cities, have been working for several years, and in no case have they failed to give great satisfaction. New York, says an American journal, has been behind most ofher sistercities. But it is proposed now to consider the subject of introducing a complete system, taking all the features which, in other cities, have proved reliable and good, and adding to them such appliances as have been brought out in the last three reliable and good, and adding to them such appliances as have been brought out in the last three or four years in the science of electric telegraphy to perfect the reliability and usefulness of the New York system far beyond all others. The general system consists in the setting up a number of iron street boxes at the positions designated by the department. These boxes are opened by responsible people, who are trusted with the fire key. When opened, an inner box is disclosed with a bell-pull upon it. This is drawn down when an alarm is to be given, and a piece of mechanism, closed up in a be given, and a piece of mechanism, closed up in a third tight box, is set in action, telegraphing with third tight box, is set in action, telegraphing with automatic exactness the number of the locality, removing the possibility of false alarm by an excited or incompetent person. The message or number is instantly struck on a bell and printed on a recording instrument at the central office, where an operator stands ready to receive it day and night. The great accuracy of the iron box machinery enables him to read the signal the first time it is sent, although the boxes are made to repeat the signal three, four or five times, as they may be adjusted. Having heard the alarm, the operator turns to another instrument of very elaborate construction, by means of which an automatically perfect alarm is sent to such places as

necessary for such an extensive telegraph is not requir.d. as it transmits successive powerful ways of electricity from the same battery to the successive lines which make up the grand system. The alarm lines which make up the grand system. The alarm machines are arranged to dispense with batteries now usually employed at the alarm stations—the machines being wound up and the electric current simply releasing the machinery. On this principle bells of any weight can be rung—one of 140b. bing during the exhibition-as easily as rung du smallest.

rung during the exhibition—as easily as the smallest.

These are the chief features of the general system. In addition is a system of magnets, called test magnets, with which it is the duty of the operator in charge to try his lines every twenty minutes, his trials being so recorded that he cannot omit any test on any line without detection, and the daily condition of all lines being recorded for reference. The improvements proposed and exhibited consist in the abandonment of the earth circuit, substituting for it the low tension metallic circuit; thus practically removing nine-tenths of the difficulties incident to telegraphy, such as escapes and high tension currents. This was very clearly demonstrated by placing two sets of lines in the earth. In one case making the earth form one part of the circuit, and in the other case burying the wires, which formed an uninterrupted metallic circuit in the earth. In one case a leak or escape completely cut off the instruments at one position of the line: in the second case no apparent effect was produced in the same instruments. Another improvement was shown to be the building of circuits of wire, so interlaging each other ments. Another improvement was shown to be the building of circuits of wire, so interlacing each other that no two neighbouring boxes or stations are placed on the same line. A third, in the introduction of a conducting wire for dangerous places, more highly insulated than if covered with glass. A fourth, an immense improvement in the introduction of a battery, costing in maintenance less than one-fifth battery, costing in maintenance less than one-fifth of those now in use, or running a year without taking to pieces, and giving a current so uniform as to almost supersede the usual necessity for adjustment, and facilitating the system of testing. This new system enables the operator in his office to ascertain quickly the condition of his line, so as to keep it precisely to the required standard to tell the position of breaks and troubles, being the result of the investigation of philosophers who have made the working of the Atlantic cable such a wonderful success. The operator then from his office can feel the condition of all his lines, and give intelligent directions for their care and preservation.

directions for their care and preservation.

The incidental advantages of such a system are the establishment of a most complete system are, the establishment of a most complete system of protection from lightning. In every box is a perfect arrester, so that any amount of the fluid, periect arrester, so that any amount of the much having so many means of access to the ground, is easily dissipated. The statistics of several cities and towns prove this. Secondly, the setting up in each iron house of a complete telegraph office, it being easy for a skilful telegraphist, having access to the inner part of the box, to place himself in consection with the central office sculing and received being easy for a skilful telegraphist, having access to the inner part of the box, to place himself in connection with the central office, sending and receiving intelligence. It is thus proposed to build the best possible lines, place upon them the most accurate machinery, take from the operator, often excited and nervous, the responsibility, the burden of confusing details, facilitate the most speedy possible reception and transmission of alarms, saving thus the precious seconds at the very commencement of a fire, giving the superintendent, also, the amplest facilities for testing and watching his lines, bringing down the responsibility to one man, and then watching and recording his acts.

# THE NAIL TRADE IN THE MIDLANDS.

THE following interesting remarks upon the manufacture of nails appeared in a recent number of "The Engineer":—The manufacture of wrought or forged nails is one of the oldest crafts in the Midlands, and although authentic records of its earlier history are wanting, there can be little doubt that it flourished in Queen Elizabeth's time when the fabrication of hadware in Birtime, when the fabrication of hardware in Birmingham and the surrounding district first began to develope. Halesowen and Dudley were perhaps the great "centres" of the trade up to the middle of the last century, since which time it has been more widely distributed, and it now constitutes the "staple" of the following localities, in addition to the two named, viz., Sedgely, Gornal, Cos-ley, Womborne, Wordsley, Rowley, Netherton, Cradley, Lye Waste, Oldswinford, Stourbridge, Bromsgrove, Northfield, Harborne, Tipton, Oldbury, Darlaston, Pelsall, Burntwood, and Westbromwich.

A feature of nail-forging, which distinguishes the craft from most others in this district, is that the workpeople are nearly all employed at their own homes as "outworkers" for the factors. Most of the cottages in the localities named have Most of the cottages in the localities named have automatically perfect alarm is sent to such places as the regulations of the department designates, it being competent to send it to every engine-house, or only a few of them—to overy or only a few of the iron boxes, thus enabling the passor-by in any part of the city to hear the locality of the fire. The machine is easily able to send to 1,000 places, but it is also arranged so that the immense battery usually



anvil, the head of which is not much larger than the face of the hammer. Each nailer, with his family, making only one description of nail all the year round, only one heading-tool is required to each hammer. Every square foot of space in and about the forge, Mr. Burritt tells us, is utilized. If the nailer and his wife or daughter are the only members of his family to use it, he often lets one or two "stalls" to his neighbours for 8d. each per week. That is, for this rate of rentage he lets a neighbour heat his rod in the same fire and make nails on the other side of the forge. I have seen four girls of about sixteen years of age standing around the same forge at once, each with her rod in the fire. The coal used must be lighter and more smokeless than anvil, the head of which is not much larger than the coal used must be lighter and more smokeless than the common sea-coal, which is apt to form a crust over the fire, thereby preventing the admission of small rods. They therefore use a kind of coke, called breese, worth 6d. to 7d. per sack of three bushels.

The nailmaster, or factor, is practically the employer of the nailer, although exercising, of course, no control over the latter, compared with the surployer of the latter, compared with the surveillance exercised by employers in large factories.

Mr. Ephraim Ball, who has been engaged in the trade for many years, aptly describes the modus operandi of the nail factor. On commencing business, he opens a warehouse in one of the nailing villages, but to carry on a large trade in all descriptions of but to carry on a large trade in all descriptions of hammered nails he must have supplementary ware-houses in various parts of the dietricts. At each of these warehouses, on certain days of the week, nail-rod iron is delivered to the nailmaker sufficient nail-rod iron is delivered to the nailmaker sufficient for him and his family to work up in a week, and at the expiration of that time he is expected to return the iron made into nails, when he receives a further supply. The length, thickness, shape, &c., of handmade nails are very numerous, and in nearly every district a different class of nails is manufactured. Those, for example, made in the districts around Dudley are not made in the neighbourhood of Bromsgrove. Among the leading descriptions of wrought nails are—Tea-chest nails, horse nails, slate nails, mule nails, hob nails, and gate nails, slate nails, mule nails, hob nails, and gate nails. The number of nailmakers in this district in 1830 was over 50,000, but at the present time not more than 20,000 are employed. The cause of this diminution is readily explained. Up to the date named (1830) all nails were either hammered or cast, and the demand for the former description especially was something prodigious. The Government contracts for the Admiralty alone averaged 600 tons of nails per annum, and the London Dock Company and the for the Admiratty alone averaged 600 tons of nails per annum, and the London Dock Company and the East India Dock Company each sent into this district orders for large quantities of tea-chest nails. The demand from the United States and Canada was likewise very considerable. Almost the whole of these sources of demand are now practically closed to the wrought nail trade.

About the real 1830 companied the manufacture.

About the year 1830 commenced the manufacture of nails by machinery, the effect of which has, naturally, been disastrous to the hand-made branch, of nails by machinery, the effect of which has, naturally, been disastrous to the hand-made branch, and the industry has ever since been steadily dying out. As early as the year 1837 it was found necessary to reduce the rate of nailers' wages, at that time over the average of artizan's earnings in the district. This step was necessitated mainly by the machine-nail competition, but it was perhaps accelerated in some degree by the rivalry of hand-made nailers in Belgium who seld their productions at artenishingly low prices. It was the germ of that formidable rivalry which the South Stafforshire iron trade has since experienced from the "Black Country" of Belgium. In 1838 a second reduction took place, and competition from the quarters indicated became so increasingly severe, that in 1842 a still greater "drop" was announced, to the consternation of the whole district. At this the nailers showed a determined resistance. On the 25th of April a rising of 20,000 nailers took place to protest against the proposed reduction, and to condemn the obnoxious truck system, which even at that time was prevalent in the trade. A monster meeting was held in the open air. The mob marched to Dudley, taking with them as prisoners several nail factors, who, having offended, had been scized by main force, and dragged along amid the jeers of the infuriated multitude. The military was called out. The Riot Act was read. Yet a monster demonstration was held, and the crowds were with difficulty dispersed. Mr. Ball informs us, as a fact worthy of notice, that the mon grossly ill-treated some of the best money-paying masters in the trade, and for this treatment they paid a heavy penalty. The trade was left to take its course. No meeting of masters to regulate wages took place for some time, and reductions of wages were made in two of masters to regulate wages took place for some time, and reductions of wages were made in two years of 20 per cent. to 30 per cent. Since that period, the history of the wrought nail trade has been a monotonous chronicle of strikes and disputations, and wages are now reduced to the lowest ebb. At the best of times, the average weekly earnings of a nailmaker are not more than 12s. to 16s. per week, and there are many who only carn 10s. Women's wages average 7s. 6d., and children's 4s.

THE death is announced of Robert Scott Lander, B.A.S., one of our best known Scottish painters. He was born in 1803.

# Begal Intelligence.

## COURT OF COMMON PLEAS. April 27.

(Sittings in Banco, Easter Term, before Lord Chief Justice Bovill and Justices Krating and Smith.) EDMUNDS v. GREENWOOD.

In this case, the Attorney-General, the Solicitor-General, Mr. Field, Q.C., and Mr. Archibald, showed cause against a rule obtained by Mr. Digby Seymour, Q.C., calling upon the Crown to show cause why an order of reference should not be drawn up embodying the terms of agreement for a reference signed by the counsel for the plaintiff and the counsel for the defendant, or why the agreement should not be cancelled, and the cause be restored to its place on the list for trial.

Mr. Digby Seymour, Q.C., and Mr. Tindal Atkin-

son supported it.

On the part of the Crown it was urged by the learned Attorney-General, and also by the learned Solicitor-General, that the Crown was prepared to meet any action the defendant thought right to bring, or, if he chose to refer his action against the Crown, to refer it. As to this rule, it was endeavoured to make the Court interfere with the terms of reference agreed upon on the ground that Mr. Edmunds had been misled, and that the Crown being in the wrong, ought to do that which was right. The action was for an alleged libel by Mr. Greenwood, the solicitor to the Treasury, in a report made by Mr. Greenwood and the late Mr. Hindmarch on certain alleged defalcations and misappropriations of money by the plaintiff while holding an office under the Crown. It was sought in this action against Mr. Greenwood, which had been agreed to be referred, to import the torms that the arbitrator should consider any claims which the plaintiff had morally or legally against the Crown. The action against Mr. Greenwood was one thing, the supposed claims made against the Crown another. It had been agreed that the stet processus in the action should be no bar to any supposed claim against the Crown, but that was a very different thing from making those supposed claims a substantial ground of reference. If they were made a substantial ground of reference, the arbitrator must entertain them; if the reference was to be no bar to those supposed claims, the arbitrator in the action referred would probably not entertain them. It was also sought to make the arbitration public, and it was a most unlikely thing that the counsel for the Crown should ever have assented to such terms of reference, and both the Attorney-General and the Solicitor-General distinctly asserted that they never had agreed to or signed any such terms.

After much difference between the learned

Attorney-General and the Solicitor-General, on the one hand, and Mr. Digby Seymour on the other, as to what had been agreed upon as the terms of reference, and as to what had really occurred,

The Chief Justice said nothing could be simpler than the terms signed by the Attorney-General. It seemed to him that the order of reference drawn up by Mr. Edmunds departed from that, and he ought not to have moved this rule. As the order was drawn up by Mr. Edmunds, it was made imperative on the arbitrator to hear the claims which Mr. Edmunds supposed he had, moral or legal, That, by the terms signed against the Crown. the Attorney-General, was never intended. rule was to draw up an order of reference, embodying the terms of the reference signed between the counsel. There could be no difficulty in doing this, and if the parties could not agree, let it be

The Attorney-General.—I have always been ready to do that. I do not think the Crown ought to have been brought here.

After some further argument.

The Chief Justice said it would be better for all parties to have the matter finally settled, without costs, as he had suggested.

The Attorney-General said he was in the hands of the Court.

Mr. Justice Keating.—Let the whole terms in the action of "Edmunds v. Greenwood" be embodied in a rule of this Court, so that there can be no further dispute.—Rule accordingly.

### ROLLS COURT. April 28. DAW v. BLEY.

HIS LORDSHIP gave judgment to-day in this suit, which has been instituted by Mr. Daw, the gun- thus terminated their labours.

maker, against Messrs. Eley, to obtain a declaration that a metal cartridge, manufactured by them, is an infringement of a patent taken out by Mr. Daw, in March, 1867, for an invention of metallic soldered cartridges, for which he obtained the prize of £400 offered by Government for the best cartridge. Our readers are well aware that Mr. Daw's invention consists of an improvement upon the old metallic cartridges, which consisted of a cylinder of metal, folded so as to form two layers unsoldered together, with a lining of paper. The defect of this form of cartridge, was that it frequently clogged the gun. The plaintiff makes his cartridges of a cylinder of very thin metal, one edge only overlapping the other, and soldered or cemented to it. e main points of the invention, as stated in the specification, were-first, the thinness of the metal; secondly, the overlapping edge instead of two or three layers; thirdly, the use of cement or solder. Each of these characteristics were well known before the patent. The plaintiff maintained the combination was now.

His Lordship, however, held that the combination did not constitute a new invention, and that the plaintiff's patent, being, consequently, worthloss, his bill must be dismissed with costs. In consequence of holding this view, his lordship did not consider it necessary to enter at length into the question of novelty of invention, being, nevertheless, of opinion that the same combination had been previously invented and published by a Mr. Rochatte, who had sold his invention to Messrs.

Mr. Jessel, Q.C., Mr. Manisty, Q.C., Mr. Macrory, and Mr. Roberts appeared for the plaintiff; Mr. Southgate, Q.C., Mr. Grove, Q.C., Mr. Aston, and Mr. Langley for the defendants.

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Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ep. M. M.

faith. Eb. M. M.
Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

as type. Special arrangements made for large advertisements.

A. MARSHALL.—The inventor of the light locomotive for common roads to which you refer is Mr. James Parker, of No. 6, Lilford-road, Camberwell. A description of the engine appeared in the MECHANICS' MAGAZINE for January 6, 1865.

F. H. R.—Thanks. The W. L. E. Railway Bridge shall appear in our next.

RECEIVED.—C. F.—G. S.—W. H. N.—J. B.—R. T.—P. S.

—W. M. C.—W. L. Bros.—T. H.—J. G. W.—I. M. E.

H. M. T.—R. M.—J. B.—H. (4. N.—R. S.—J. S.—T. T.—A. M.—G. H.—M. S.—F. W. B.—R. J.—J. W.—B. L.—R. T.

—B. H.—A. D.—W. and Co.—H. M.—J. E.—G. W. H.—B. T.—H. W.—R. F.—J. B.—W. H. N.—C. D. and Co.—R. B.—F. H. R.—T. W.—A. R. and Co.—J. G.—C. P. C.—H. S.—L. O.—R. D. T.—F. J. N.

# Micelinas for the Edeck.

MON .- Royal Institution .- General Monthly Meeting, at

MON.—Royal Institution.—General Monthly Meeting, at 2 p.m.

Royal United Service Institution.—Mr. Charles W. Eddy. M.B., on "A Mocable Steel Muntelet for the Protection of Field Artillery and Troops," at 8:30 p.m.

Royal Institute of British Architects. — Annual General Meeting, at 8 p.m.

Society of Engineers.—Mr. William Sugg on "The Systems and Apparatus Employed for Illumination by Coal Gas," at 7:30 p.m.

TUES.—Royal Institution.—Professor Grant on "Astronomy," at 3 p.m.

The Institution of Civil Engineers.—Discussion on "The Outfall of the River Humber:" and, time permitting, Mr. John Ellacott, M. Inst. C.E., on "Description of the Low Water Basin at Birkenhead," at 8 p.m.

THURS.—Royal Institution.—Professor Tyndall on "Light," at 3 p.m.

Fal.—Royal Institution.—Captain Monerleff on "The Monerieff System of Working Artillery," at 8 p.m.

Royal United Service Institution.—Mr. Robert H.

Moncried System of Spin, 8 p.n., 8 p.n., Robert H. Scott, Director Meteorological Office, Board of Trade, on "Storms on the British Coasts, and Telegraph Weather Intelligence," at 3 p.m.

SAT.—Royal Institution.—Professor Seeley on "Roman History," at 3 p.m.

THE Select Committee upon the Metropolitan Street Transways met again on Monday and passed the preambles of the three bills before them, and



# Correspondence.

# SHIPS OF WAR.

TO THE EDITOR OF THE "MECHANICS" MAGAZINE

SIE,—As regards the originator of the twin screw mode of propulsion, I think we are all agreed that the late Mr. G. Rennie was the first engineer who practically tested the system. While engaged with the firm, I was early enlightened as regards the merits of twin screws. In 1864, I proposed a navigable dock, to the Lords of the Admiralty, suited to lift the "Warrior." It was arranged so as to follow a fleet in time of war. The mode of propulsion I advocated was "twin screws" (your readers will see the form I proposed by referring to your magazine). As regards my present proposal, I have not deemed it necessary to present it to the officials at Whitehall. Your correspondent must know that I do not advocate the Moncrieff system in its best application—namely, to land forts—without a covering; but this I advocate, that the Moncrieff is as well suited for ships of war as any system we have in the Royal Navy. The ships are nothing but huge turrets; strong on the sides and very weak top and bottom. A shot, vertically fired, will go right through them, and had "F. H. R." looked into the form of turret proposed for the new ships he could not fail to observe that the revolving turrets have no covering at top, although a covering may be fitted. He will, likewise, see that the turrets are -As regards the originator of the twin screw not tall to observe that the revolving unrets have be fitted. He will, likewise, see that the turrets are protected with a shield at the bottom. One shot hitting the shield would disable the turret; it would be jammed in its place, and all the force exerted through the medium of wheels would not move it. There are too many wheels in all turrets which are made to revolve; the complication is fearful, but nothing to the complication of a ship of war wholly unprotected from vertical fire. My twin structure, 1 am aware, is rather startling; the form is new, and there can be no doubt that it would tend in some there can be no doubt that it would tend in some cases to lessen the midship area. A river of water flows through the "Hercules" or vessels of that type; but is the U form the most stable, or is it the best form to suit ships of war, as regards speed? I think not, and, as regards percussion, the "Hercules" would never give a second blow at full

speed.
What we require in ships of war is breadth. authorities may make as many ships as they choose strength cannot be got into them without heavy scantling; and even then they are not suited for perscanting; and even then they are not suited for per-cussive warfare. I maintain my twins are, as like-wise for modern warfare, combining great strength with speed. In another arrangement, I have intro-duced fixed covered turrets, along with broadsides. As I stated, we have no experience with or without turrets, and in mechanical applications we must simply study what would be the effect of an elon-gated shot on the various proposals. I think the cone is better than the revolving turret, no top pro-tection in either to be accepted.—I am. Sir. yours. tection in either to be accepted.—I am, Sir, your &c.,
John G. Winton.

13, Gladstone-street, St. George's-road,
April 24.

# EDWARDS' TRAIN SIGNALS.

SIR.—In an article in your last impression, describing my system of train signalling, you state that if a greater amount of indraw than 18in, or 20in, is necesary, the system is useless. Permit me to state that this is not so. The amount of indraw can be increased this is not so. The amount of indraw can be increased to 3ft. 10in. momentarily; and with the modified plan, where no detectors are used, any amount of indraw can be made—even 50 yards, if necessary—and signals given through any number of carriages.—I am, Sir, yours, &c. JOHN EDWARDS. 157, Richmond-road, Hackney, April 23.

# SHEATHING IRON SHIPS.

SHEATHING IRON SHIPS.

SIR.—From an article in your issue of last week, it appears that no reliable, and certainly no economical, plan has yet been tried to effect the sheathing of iron ships. All the methods tried or proposed appear to me to be mere makeshifts, and tending to diminish rather than add to the strength and durability of the structure, and they are all very costly, to boot. I have on former occasions advocated a plan of sheathing iron ships, which I.—like most others who have plans to propose—feel convinced, would, if once fairly tried, settle this vexed question. But I shall let the proposal speak for itself. I may premise, however, that in working it out the details can be considerably varied.

I shall begin with laying down a wooden keel;

as may be desired, perhaps no farther than load line. To these wooden frames nail the wood sheathing; 6in. broad and 4in. deep for these wooden frames and sheathing of about 2in. thick may be a fair scantling for a ship of large size. A wooden stem and sternpost would complete the outside casing, on which either copper or zinc could be nailed in the ordinary way. All this woodwork can be securely attached to the iron hull without a single bolt-hole being either tapped into or pierced through it. The iron hull would be intact; even the wooden frames could be attached by brackets without a single bolt-hole being in them either.

It will be perceived that there is a space of 4in., (the depth of wood frames), between the wooden sheathing and iron hull. Now, it is evident that were this space filled in with some adhesive and slightly elastic material, great additional strength and durability would be gained, and any galvanic action that might exist between the copper and iron would thus be completely cut off. Various substances could be suggested as suitable for this purpose. In the case of this space not being filled up, the keelson should have the form of a hollow girder, made completely watertight, and any water the vessel might make through the sheathing should be

pose. In the case of this space not being inied up, the keelson should have the form of a hollow girder, made completely watertight, and any water the vessel might make through the sheathing should be conveyed there—and there only—to the pumps.

With regard to cost, we have the wooden frames and sheathing, wooden keel, wooden stem, and wooden sternpost, and workmanship on these all extra from an ordinary iron ship. Per coutra we save the expense of iron keel, iron stem, and iron sternpost, all very expensive articles. We save also considerably in workmanship on the iron department, which would be got up with much less expense than now. Everything considered, it is questionable if first cost on this plan would go much, if anything, beyond the mere iron ship. But when we come to look into the probable cost of the various methods that are being tried to gain the same ends, this one will be found to be beyond compare the least expensive, and, as I have already said, I feel convinced it would also be found to be by far the most effective.

—I am, Sir, yours, &c., -I am, Sir, yours, &c., April 28.

# Nabal, Military, and Gunnery Items.

THE last monthly statement, issued by the Bureau Veritas, of Paris, shows that during the month of March last, 299 vessels, including 16 steamers, were reported as total losses. The casualties were distributed among different nationalities as under:—124 English, 58 French, 32 North German, 15 American, 13 Italian, 9 Greek, 9 Norwegian, 6 Austrian, and 33 hospital reprises the flags. bearing various other flags.

THE American steamer "G. A. Thompson" struck THE American steamer "G. A. Thompson" struck a snag on Arkansas river, in Arkansas, on the night of the 9th inst., and was a total loss. She had on board eighteen passengers, and was laden with a cargo containing lime, which slacked on getting in contact with the water, set fire to the boat, and severely burnt several of the crew and passengers. Seventeen lives were lost by burning and drowning. The line of Count Tilly, the celebrated opponent of Gustavus, in the Thirty Years' War, has just become extinct by the decease of Count Charles Gustavus Edward Augustus von Tserclas Tilly, at the ripe old age of 85. He had been Chamberlain to the King of Holland, and a member of the Equestrian order of

age of 85. He had been Chamberlain to the King of Holland, and a member of the Equestrian order of Brabant, and was the last direct descendant of Eve-rard von Tserclas Tilly, the liberator of Brussels in 1356, and of his descendant above alluded to, who was generalissimo of the Catholic League in the 17th century.

On Saturday morning, Joseph Cawthorn, a native of Newark, died at Sunderland, at the age of 79. The deceased, who had volunteered into the Rifle Brigade, fought in nearly all of the hotly-contested engagements in the Peninsula, as well as at Waterloo, where he was wounded. He received his discharge in 1819 without a pension. In 1866, he was in the receipt of a pension of only 1s. per day, and this was obtained by the most strenuous efforts on his behalf.

THE report of General Sir J. Hope Grant, on the The report of General Sir J. Hope Grant, on the Easter Review of Volunteers at Dover, is just published. It speaks in the highest terms of all the arrangements, and particularly those of the South-Eastern and other railway companies concerned; but, while giving credit to the Volunteer force for willingness and intelligence, the general's report contains the following ominous sentence:—"In my opinion, this force cannot be really serviceable, if it be not placed, while under arms, under some more stringent military control. Such a large body of armed men not amenable to any military discipline might be the cause of very serious embarrassment."

CAPTAIN JOHN GRORGE PHILIPPE the last sur-

co-operated in the siege of Genoa, and took part in the operations of 1801 in Egypt. He also served in one of eight boats cutting out the "Esmeralda" and "Pas," Spanish corvettes, in Barcelona roads, in 1800. From 1802 until prometed to Commander, in 1814, he was employed successively on the home and North American stations, in the Channel, on the north coast of Spain, at Portsmouth, at Newfound-land, in the Baltic, and in the Downs.

# Miscellanen.

THE third pumping engine for the Brooklyn Water Works, now being built, will be the largest and most powerful pumping engine in the world, with the exception of one in Cincinnati.

The number of visitors to the Patent Office Museum, South Kensington, for the week ending April 24, was 3,937. Total number since the opening of the Museum, free daily (May 12, 1858)

THE master and fellows of Trinity have decided to entrust to Mr. Woolner the execution of the monument to Dr. Whewell, which is to be placed in the ante-chapel of the college. The statue of the late master will stand next to that of Lord Macaulay, some little distance to the right of Roubilliac's well-known statue of Newton.

known statue of Newton.

WE ("Athenseum") hear with great pleasure that the Subject Catalogue of the MSS. in the British Museum is making good progress in the energetic hands of the Keeper of the MSS. and his able assistants. The first drafts of the work have been already made and bound in portly folios, and the rest are going well ahead. These will form the groundwork of a fresh and complete description of the whole of the MSS and fully described in the old catalogue. the MSS. not fully described in the old catalogue.

THE number of gallons of proof spirits distilled in the United Kingdom was 26,750,684 in 1865, 25,567,962 in 1866, 23,323,613 in 1867, 24,928,155 in 25,567,362 in 1866, 23,323,613 in 1867, 24,922,135 in 1868. The quantity retained for consumption in the United Kingdom as beverage was 20,811,155 gallons in 1865; in 1866, 22,216,390 gallons; in 1867, 21,199,376 gallons; in 1868, 21,008,634 gallons. All this time the population was increasing by, at all events, 1 per cent. per annum.

THE number of visitors to the South Kensington The number of visitors to the South Kensington Museum during the week ending April 24, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 14,175; Meyrick and other galleries, 3,048; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,623. Meyrick and other galleries, 245; total, 20,091. Average of corresponding week in former years, 12,787. Total from opening of Museum, 8,375,877.

12,787. Total from opening of Museum, 8,375,878

A PARLIAMENTARY paper showing the amount of coinage at the Mint during the last ten years past was issued on Wednesday. In 1868 there were coined in gold, 1,653,384 sovereigns; in silver: 896,940 florins; 3,330,360 shillings; 1,069,200 sixpences; 4,158 fourpences; 1,461,768 threepences; 4,752 twopences; 7,920 pence; in copper: 1,182,720 pence; 3,046,400 halfpence; 4,851,208 farthings. No half-crowns have been coined since 1851. Worn silver of the nominal value of £125,000 was purchased for recoinage, the loss on which was £18,058.

chased for recomage, the loss on which was £18,058.

The second spring flower show of the Royal
Botanic Society was held on Tuesday in the gardens
of the society in Regent's Park. The show, considering the early period of the year, was an exceedingly fine one; the roses, especially, were presented
of a size and beauty hardly to be exceeded in the or a size and beauty harmy to be exceeded in the shows later in the season. Some splendid standard azaleas were exhibited by Mr. C. Turner, of Slough. There were also a very fine display of flowers in the miscellaneous classes—cinerarias, amaryllis, lilies of the valley, auriculas, &c.

lilies of the valley, auriculas, &c.

A LARGE fan, on the Guibal principal, was started at the Byers Green Colliery on Monday week, and did good work. It was run up to 60 revolutions per minute, and at this speed produced 68,000 cubic feet of air per minute, with a water gauge of 3-10 in. The quantity of air previously got by the furnace was 11,000 cubic feet below the quantity produced by the fan, or 57,000 cubic feet. The fan has not yet been worked up to its maximum power, as it is guaranteed by the maker to work up to 70 revolutions per minute. The makers are Messrs. Black, Hawthorn, and Co., of Gateshead.

alan of sheathing iron ships, which I—like most others who have plans to propose—feel convinced, would, if once fairly tried, settle this vexed question. But I shall let the proposal speak for itself. I may premise, however, that in working it out the details can be considerably varied.

I shall begin with laying down a wooden keel; on this keel put up, say, one-half of the iron frames, then plate on these frames as usual, but the plating and riveting need only be done in the same style Rivet heads may be either inside or outside, and the plating would not demand exact shearing, as now. When the plating is finished, attach the other half of the iron frames outside the vessel's plating, spaced midway between the inside ones. Alongside of these outside iron frames, running from keel to gunwale, or so far up

THE manufacture of soap may now be added to the list of the local industries of Adelaide, a soap-boiling factory having lately been established at Port Macdonald, capable of producing about two tons of soap weekly. Besides the advantage of an important local industry in connection with this manufacture, the butches will how find a ready market for tallow the butchers will now find a ready market for tallow and fatty refuse, and the money hitherto sent out of the colony for the purchase of soap will, in part at least, be kept there for profitable employment.

A SERIOUS accident happened at some extensive Cornish slate quarries, at St. Teak's, on Wednesday Cornish slate quarries, at St. Teak's, on Wednesday week. The pits are near Camelford, and excavated by the uninterrupted labour of centuries, are encompassed by mountains of rubbish. The slate is obtained at a depth of 260ft., and drawn up to the surface by a projecting pulley, rigged in what is called a papote head, and, with its gear, of tremendous weight. A large number of men were at work weight. A large number of men were at work below, when the papote head gave way, and many were buried beneath the mass. Twenty-three were got out speedily, but nine were dead, and the others severely injured. The total loss of life is at present the men are yet missing. unascertained, as many of the men are yet missing.

A PEARFUL catastrophe is reported from the mining regions near Gold Hill, Nevada. On April 7, a fire broke out in the shaft of the Yellow Jacket Mine, and soon communicated, through underground passages, to two neighbouring mines known as Brown Point and Old Kentuck. The fire was ex-Brown Point and Old Kentuck. The fire was extinguished after burning fiercely for three days. Forty lives were lost, and the bodies of the dead have not yet been all recovered. These mines have been carried to a great depth in the earth, and the been carried to a great depth in the earth, and the subterranean passages extend through a wide space. The heat at all times is great, 100deg, of Fahrenheit being the usual temperature, and dried the timber used in the shafts and passages, so that when the fire began it spread with rapidity. It was extinguished by stopping all the outlets at the surface, and injecting steam, thus smothering the sames.

and injecting steam, thus smothering the flames.

At the last monthly general meeting of the Zoological Society, held at the society's house, Hanover-square, Viscount Walden, president, in the chair, Colonel C. H. Hutchinson, Captain J. G. Noble, Captain J. W. T.Bulkeley, Mrs. Mary Ann Coleman, Miss Emily Routledge, and Messrs. A. A. Smith, C. Branch, N. Bradford, L. A. Mansse, A. R. Tull, E. R. Alston, F. F. Simond, E. Rayner, William Fairlie of Holmes, Robert P. Wilson, William S. Smith, Henry A. Blythe, Alfred Gillett, Charles Russel, John Gordon of Cluny, Henry Johnson, T. P. Tindale, William Todd, F. W. Lucas, William Westley, J. B. Austin, S. O'Brien Hoare, Henry Gaskell, and S. Russell were elected Fellows, and Mr. John Brazier, of Sydney, New South Wales, a corresponding member of the Society. Thirty-three candidates for the Fellowship were proposed, and ordered to be balloted for at the next meeting of the society. of the society.

THE following notification, dated Board of Trade THE following notification, dated Board of Trade, April 12, appeared in the "London Gazette" of the 13th inst.:—With reference to the notice inserted in the "London Gazette" of January 1 last, stating that the Argentine Government had offered a prize of £1,000 for the best system of preserving fresh meat, the Board of Trade have received from the meat, the Board of Trade have received from the Secretary of State for Foreign Affairs a copy of a further despatch from Her Majesty's Minister at Buenos Ayres, reporting that the Government of the Argentine Confederation have issued a further decree, to the effect that the prize can only be obtained by those persons who, whether at home or abroad, have carried out their discovery in practice, and who produce the result at the Ministry of the Interior, in order that the scientific commission which will be named for that purpose may, after examining the results, adjudge the prize to the one offering the greatest advantages at industry. As a consequence of this decree the period for the presentation of proposals has been extended till August 31 next.

# Patents for Inbentions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.—3114, 3121, 3125, 3138, 3141, 3153, 3157, 3159, 3172
GENERAL MACHINERT—3114, 3116, 3122, 3123, 3136, 3143, 3145, 3146
LIGHTING, HEATING, AND VENTILATING—3116, 3124, 3132, 3133, 3151, 3154, 3160
METALS, including apparatus for their manufacture—3112, 3123, 3148
MISCELLANEOUS—3115, 3116, 3118, 3119, 3127, 3128, 3130, 3142, 3149, 3150, 3155, 3162, 3168
BOADS AND VENICLES, including railway plant and car riages, saddlery, and harness, &c.—3111
SHIPS AND BOATS, including their fittings—3120, 3122, 3134

3134 Steam Engines—3114, 3169 Warfare—3115, 3131, 3134, 3164, 3165, 3173

3111 F. BARNETT, Paris. Artificial paving. Dated October 10, 1868.

ber 10, 1868.

This consists in the manufacture of a material suitable for forming roads and pavements, which is called "iron asphalte." Its composition is, of natural or artificial bitumen, 45 parts; of natural sesquioxide of iron, or of pulverized iron ore, 45 parts; of purified mineral tar, 10 parts.—Patent completed.

10 parts.—Patent completed.

3112 T. Merz and G. Thomson, Hebburn, Durham.

Calcining ores. Dated October 10, 1868.

This consists in applying a revolving furnace, such as that used in alkali works, for transforming sulphate into carbonate of sods, to the calcination of ores, minerals, and other substances, especially copper ores, or copper ores mixed with sait or other chlorides. In addition to the revolving furnace, smokeless fire gases or fiames are employed for heating the furnace. These may be obtained by burning a suitable combustible gas, such as coal gas or carbonic oxide, or by burning coal, or other solid fuel, in a furnace, arranged so as to insure the absence of smoke.

—Patent completed.

3113 R. Too Leith, N.B. Separating partially ground.

—Patent completed.

3113 R. Top Leith, N.B. Separating partially ground grain. (A communication.) Dated October 10, 1863.

Three modifications of apparatus are comprised in the invention, and in two of these the exhaust action of a blowing fan, or its equivalent, is employed to accomplish the separation and cleaning, whilst, in the third, the blowing action of the fan is used in a similar way.—Patent completed.

completed.

3114 S. J. MACCARTHY, Charlotte-street, W. Securing boots and thoes. Dated October 10, 1868.

The edges of boots or shoes which it is desired to close or hold together are attached to flexible ribs, grooves, or guides formed of "dexible metal" links or chain of suitable form. Upon, around, or within the flexible ribs a sliding-piece, formed of metal, is arranged, which is so formed as to be readily moved along the ribs, but which is always retained upon both of them. The sliding-pieces are so formed as to bring the two edges of the article as near together as may be desired at that part where the sliding-piece is placed, and when the latter is withdrawn from, or moved to, one end of the flexible ribs, the edges of the material to which they are attached can be opened, loosed, or separated from one another.—Patent completed.

pleted.

3115 F. A. ABEL and E. O. Brown, Woolwich. Firing explosives. Dated October 10, 1868.

A small cylinder or tube, closed at one end, and consisting of metal, wood, paper, papier mache, cardboard, or a combination of these, is charged with a small quantity of fulminate of mercury (say, from 10 to 30 grains, if a metal tube be used). A loose plug of gun cottom is inserted over the fulminate, so as to confine the latter in the closed end of the tube. The open end is then closed with a piece of thin paper, which may be varnished to exclude moisture.—Patent completed.

3116 W. H. ST. AUBIN and B. BENTON, Wolverhampton.

clude moisture.—Patent completed.

3116 W. H. ST. AUBIN and B. BENTON, Wolverhampton.

Cocks and taps. Dated October 10, 1868.

This chiefly consists in a socket, made of brass or other

metal, having a flange at its front or outer extremity, and
also perforations through the convex sides of the socket

(which is intended to be fixed into the tap hole of the

cask). Into the socket a hollow conical plug is fitted,

which also has perforations. Upon the solid end of the

plug there is a screw, having a square shoulder passing

through a washer, fitting tightly against the end of the

socket, being held there by a nut, which fits upon the

screw or screwed pin. The invention also consists in a

tap having at one end a slot, corresponding with and

fitting the toagues upon the hollow conical plug. Upon

the outer surface of the same end of the top there is a

groove, into which a ring of india-rubber is placed.—

Patent abandoned.

3117 W. R. Lake, Chancery-lane. Electro-plating. (A

Patent abandoned.

3117 W. R. LAKE, Chancery-lane. Electro-plating. (A communication.) Dated October 10, 1868.

This consists, first, in suspending or supporting a mass of the particles of nickel within the solution, so as to present an extended surface, and connecting them with the positive pole of the battery, by means of a platinum or other conductor, not materially affected by the electric current or the solution employed. Second, in lining the whole or a portion of the interior of the vat or vessel which contains the solution with carbon or other suitable conductor of electricity, not materially affected by the electric current or solution, so that the particles of nickel may be placed upon the lining at the bottom of the vat in such a manner as to present the desired surface, the lining of the vat being connected with the positive pole of the battery. Third, in the employment of a plate of metal, carbon, or other conductor, upon which a coat of nickel of sufficient thickness has been deposited as a positive electrode, to be suspended in the ordinary manner, and connected with the positive pole of the battery.—Patent completed.

3118 F. W. Harr, Kingaland-green. Varnishes. Dated

uniform liquid, by a beating machine or whisk. The printed surface of the paper which has been previously dried, is then coated with the albumen thus prepared.

-Patent completed.

3119 N. SMITH, Glasgow. Treating wasts acid liquors Dated October 12, 1868.

The object is the recovery of the valuable products contained in wasts acid liquors, such as are obtained in galvamizing works. When the acid is too weak to be further used, it is saturated with iron, preferably in the form of steel scrap. If it still contains any free acid, as much lime mixed with water as will precipitate the iron is then added. The precipitate is drained, washed, dried, and burned in a suitable furnace, and, if necessary, again washed and dried. The resulting product is oxide of iron.—Patent completed.

2120 C. D. Arriv. Southammton-buildings. W.C. Pro-

aligo C. D. Aber, Southampton-buildings, W.C. Propelling vessels. (A communication). Dated October 12, 1868. This consists in constructing a propeller, composed of shelical or screw blade, fixed upon a shaft, and enclosed by a cylinder, open at the ends, which is fixed to the outer circumference of the screw blade, and, consequently, made to revolve therewith.—Patent completed.

3121 J. Moon, J. H. Donaldson, and E. J. Harris. Oxford-street, W.O. Bedsteads. Dated October 12, 1863. This consists in fixing bedsteads, by means of dovetailed joints or slots, in metal placed either at the sides and ends of bedsteads, or between the ends of bedsteads.—Patent abandoned.

3132 W. MOODIE, Glasgow. Propelling and steering.

ananoned.

3132 W. Moode, Glasgow. Propelling and steering.
Dated October 12, 1868.

This consists, mainly, in mechanism for the propelling or the steering of ships. A main vertical revolving shaft works in a footstep bearing in the keel of the ship, and the journals are in frame bearings above the deck. The shaft carries the two thin and nearly flat rectangular propeller vanes, floats, or blades, one on each side, and exactly opposite to and equi-distant from it, each revolving on its own axis or axial shaft. Lower footstep stud pivots near its centre are parallel, and in a plane with the axis of the main shaft. The pivots are secured to and project up from a two-armed plate or frame-piece, keyed or fixed to the lower end of the shaft, near or close to the lower ends of edges of the floats; the shafts have their lower ends collared or fixed by lateral feathers to them, and the journals work in bearings formed or bushed in the upper armed plate, which is keyed or otherwise secured to the main shaft, close to the extreme upper ends or edges of the vanes or floats, which revolve on their own axes freely between, and with their edges just clear of the carrying arms of their duplex frames, which are strengthened at their outerends by the diagonal stays and main actuating shaft at the centre.—Patent completed.

3123 T. B. Jordan, South Lambeth. Breating minerals.

shaft at the centre.—Patent completed.

3123 T. B. JORDAN, South Lambeth. Breaking minerals.
Dated October 12, 1868.

The breaking machine is a strong cast-iron frame or box containing a hard iron ram, and two wedge-shaped checks, also of hard iron, which have faces curved in horizontal section, and are kept in adjustment by massive wedges against which they are bolted to the frames, by properly arranged adjusting screws. The dressing machine consists of a large hutch or tank of any suitable material for containing water. A sieve of any required mesh is fixed in this tank a few inches below the water surface; over this sieve at one end is a large hopper, from which a narrow adjustable opening, extending the entire width of the sieve, having its mouth on the required level of the surface of the stuff under treatment, furnishes a self-acting adjustment for the depth of sand on the seive bottom.—Patent abandoned.

3124 S. LEONI St. Paul's-street N. Heating and cooking.

abandoned.

3124 S. LEONI, St. Paul's-street, N. Heating and cooking. Dated Uctober 12, 1868.

This relates to cooking by gas, and consists in a portable or fixed frame or stand with a gas ring, and arrangements for the supply of air and gas together; also in a cylinder of fireclay open at the bottom, with a cover of fireclay at the top to act as a reflector of heat. This cover is suspended so as to admit its being lifted off, and let down upon the top of the said cylinder as required, and insome cases the frame is turned on a pivot, so as to remove the cover from the cylinder, and in other cases the cylinder is mounted on wheels, and drawn out from the frame, in order in either case to afford access to the interior of the cylinder, for the purpose of removing the meat or other food therefrom when cooked.—Patent completed.

3125 A. Field and A. W. Tulk, Minories. Show boards

from when cooked.—ratent completed.

3125 A. Field and A. W. Tull, Minories. Show boards
Dated October 12, 1868.

The projecting parts, ribs, or feathers of show boards
are made straight or of a rectangular or curvilinear form
of plain wood, tin, cardboard, or other suitable material,
and the patentee print the required parts of letters, marks,
or devices by means of lithographic stones, wood blocks
type, or equivalent printing surfaces upon material suited
to receive the printed impression, and capable of being
cut into slips and folded, so that the printed slip may be
affixed to the two sides of the feather.—Patent completed.

3126 W. BRAILSFORD and J. GADSBY. Lace. Dated ecober 12, 1868.

3126 W. Brailsford and J. Gadest. Lace. Dated October 12, 1868.

This consists in manufacturing on single tier machines employed in the manufacture of bobbin, net, or twist lace, an embroidered traverse warp net, the pillars of which are each made with one bobbin thread and one warp thread, while the crossings are made with two warp threads, the warp threads the width of the broadth, being made, and, if desired, to traverse the whole width of the machine. When the warp threads arrive at the extremities of the breadths, the left-hand back warp thread is placed in the front, and the right-hand front warp thread is placed in the back.—Patent completed.

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elastic connection, so that the distance between the centro of the sliding pulley and the fixed end of the elastic con-nection is made to vary as the ends of the carriages vary in distance from the action of the buffers and draw springs. -Patent abandoned.

—Patent abandoned.

3128 T. F. CASHIN, Sheffield. Safety switches and rail joints. Dated October 13, 1803.

This consists, first, in switch levers for working single sets of points on sidings of main lines, branch lines, or for shuntings. Second, in combined levers and appliances for working the points and signals of junctions or stations. Third, in a self-acting arrangement for catch sidings on inclines, and for permitting trains to run behind the points at junctions and stations without deranging the locking gear. Fourth, in a contrivance for forcing the points home close, and crushing any compressible matter that may be between them and the rails when a train is passing over them; and, fifth, in a method for preventing the abutting ends of fish-jointed rails from being depressed below one another, or the connecting bolts from being turned loose.—Patent completed.

3129 W. A. LYITLE, General Post Office, London.

—Patent completed.

3129 W. A. LYTTLE, General Post Office, London.

Electro-telegraphic conductors. Dated October 13, 1868.

This consists in the use of two voltaic batteries or other sources of electricity, one being placed at each end of the wire or other conductor. The positive pole of one voltaic or other battery is connected by means of the conductor with the negative pole of the battery at the opposite end of the system, and the remaining poles of the respective batteries are connected together either by means of a second "return" wire, or by means of the earth,—Patent abandoned. abandoned.

3130 H. C. CLIFTON, Clerkenwell. Ornaments. Dated October 13, 1868.

aliao H. C. CLIFTON, Clerkenwell. Ornaments. Dated October 13, 1863.

This relates to the moulding of ornaments in the material known as "composition." The invention consists, first, in forming such ornaments in a continuous manner by means of machinery arranged as follows:—Upon a long bed is placed a travelling table or board, upon which is laid the composition. At one part of the bed are two upright frames carrying a cylinder or roller, by preference of gun metal or brass, upon the surface of which is carved or engraved the ornaments to be impressed upon the composition. This cylinder receives rotary motion by means of spur wheels from a shaft below the travelling table or board, upon which shaft is a roller pressing against the under side of the table or board, and receiving motion by means of a spur pinion, the shaft of which has either a crank handle turned by hand, or it may be turned by any other source of motive power. The engraved cylinder is carried in sliding blocks in the upright frames, which blocks are capable of being pressed forcibly down to any required extent by means of adjusting screws carried by the framing. The table or beard with the composition laid or spread thereon, is pushed forward so as to enter between the engraved cylinder and the roller beneath, when rotary motion being imparted to the cylinder and roller, as above described, the table or board with the composition. The entire length of the table or board having thus been passed through between the cylinder and roller, it is removed and is replaced by a second table or board with the composition readylaid or spread thereon.—Patent completed.

3131 F. A. Le Mat, New Orleans, U.S.A. Revolters.

completed.

3131 F. A. LE MAT, New Orleans, U.S.A. Revolters.
Dated October 13, 1863.

This relates to those revolving firearms in which, in addition to the ordinary barrel and revolving breech chambers for ball cartridge, there is a central charge chamber and a separate barrel intended for firing grape or duck shot. The invention consists in the combination of the charging of the revolving breech chambers as well as the central chamber is made at the breech. The explosion in both cases is effected by a pin. The hammer head is composed of two parts, articulated together, one of the parts being called the lateral hammer head, which acts upon the ball cartridges in the revolving chamber, and the other part, called the central hammer head, and which acts upon the grape or duck cartridge of the central barrel. The breech of the central barrel carries the pin, and at the same time favours the automatic action of the arm are very strong, owing to the particular arrangement. and at the same time rayours the saltilling or rocking cartridge extractor, owing to the par arm are very strong, owing to the particular arrangement.

—Patent completed.

Patent completed.

3132 G. N. SANDERS, Langham street, W. Lamps.
Dated October 13, 1868.

A glass or globe of peculiar form is employed, consisting of a vertical tube, forming the lower part, which suddenly expands, horizontally, or nearly so, into a wide cylinder, open at the top, the whole being somewhat like an inverted wide bottle. The tube of the glass rests at bottom on a triangle or frame on the gas pipe. On the top of the glass tube, and inside the glass cylinder, a tube or cylinder of tale, or other suitable bad conductor of heat, is placed, which is interposed between the glass tube and the ring burner, so as to provent any air passing from the glass tube to the outside of the burner. The tale also prevents the heat being transmitted from the metal of the burner to the glass. A ring burner, or cetagonal or other angular burner, with a central opening, is employed. The inner upper edge of the burner is chamfered, and the gra a apertures placed on the outer edge, so as to prevent shadows.—Patent abandoned.

3123 W. T. Scog, Vincent-street, S.W. Regulating supply of gas. Dated October 13, 1868.

This relates to previous letters patent (No. 2277), dated September 5, 1866, and consists in numerous improvements in detail in the apparatus and method therein described.—Patent completed.

-Patent completed.

3134 R. Dawson, Plymouth. Gunboats. Dated October 13, 1863.

This consists in constructing gunboats of two separate floating bodies of the same size and shape, and in connecting them togother at a suitable distance asunder, and in forming a cupola of the entire width of the two aforesaid parts, at the midship section thereof, and in fitting the guns, steering wheel, capstan, and propeller all within the cupola, so that the whole working and fighting of the gun boat can be effected within the cupola, and the whole view of the horizon be commanded.—Patent completed.

3123 R Spiece Gower-place W. C. Tokapo jure. Dated

3135 R. Spier, Gower-place, W.C. Tobacco jars. Dated letober 13, 1863.

This consists in adapting a perforated bottom to jars.

The bottom edge of the jar fits into a loose bottom or stand containing a pad, capable of absorbing and holding water, the object and intention being to keep the tobacco from getting too dry.—Patent abandoned.

from getting too dry.—Patent abandoned.

3136 J. WORSTER, Camborwell. Holding sterestype plates.
Dated October 13, 1863.

The blocks on which the stereotype plates are supported whilst impressions are taken therefrom are pressed in three or more parts, each part being of the form of a triangle, or approaching thereto, and being provided with flanges, projections, or catches, rising above the surface of the supporting block or blocks. These flanges, projections, or catches are saitably underent or inclined on their inner sides, so as to hold the stereotype plate. The triangular parts or blocks are formed of various sizes, so as to facilitate the making up of a block to the size of the stereotype plate to be supported.—Patent completed.

3137 W. YATES, Duko-street, S.W. Furnaces. Dated October 13, 1868.

October 13, 1868.

This relates more particularly to puddling, converting, and re-heating furnaces, in which iron and steel are operated upon, and consists in constructing such furnaces or protecting their inner surfaces by a lining, so that they will be better able to resist the great heat to which such furnaces are exposed in metallurgic operations.—Patent completed.

3138 W. R. LAKE, Southampton-buildings, Chancery-lane. Dyeing hair. (A communication.) Dated October 13,

The two substances producing the dyeing effects are nitrate of silver and gallie acid. These substances are prepared for use in the following manner and proportions:

—Nitrate of silver one part, and gum arabic eight parts, dissolved in water and heated to 125deg. Fah., and formed dissolved in water and heated to 125deg. Fah., and formed into a glutinous paste, and gallic acid one part, and gum arabic twelve parts, dissolved in water and formed into a paste. In place of the gum arabic, which is only employed as a vehicle, any suitable glutinous substance, of a similar character, may be used, which will easily dissolve in water, and which possesses sufficient adhesiveness to hold, when dried, the gallic acid and nitrate of silver upon the implement.—Patent completed.

upon the implement.—Patent completed.

3139 R. Ronotham and C. Ezard, Beswick. Top bar frequets. Dated October 14, 1868.

This consists in so arranging the top bar that it may very simply be made to fit accurately to any size of firebar. This is accomplished by making the claw or claws on one side loose, so that they may be moved nearer to, or further from, the others, as the case may require, and when properly adjusted, the loose claw or claws may be fixed in their proper positions by means of a screw.—Patent abandoned.

3140 J. Shanks, Barrhoad, N.B. Water-classit. Dated

3140 J. SHANKS, Barrhead, N.B. Water-closets. Dated October 14, 1868.

3140 J. SHANKS, Barrhead, N.B. Water-closets. Dated October 14, 1868.

This consists in forming a channel round the rim of, and in the same piece with, the earthenware or enamelied iron basin of the closet. The flushing water, entering by an inlet, is made to pass through a hollow rim, and thereby has a whirling motion imparted to it, whilst enough water will run out of it after the tap is closed to ill the basin to the desired height and seal the outlet. This simple contrivance renders any complicated "regulator" quite unnecessary, and the water tap may be arranged to close simultaneously with the main valve, which admits of the simplest possible connections of the working parts. In making the channel in earthenware it is convenient to form it completely round the basin rim at first, and then to insert a nozzle-piece at one side of the inlet, and compel the water to make the complete circuit of the rim. Fine holes are made at various points in the inner and under side of the hollow rim, to admit air, and thereby make sure of the emptying of the channel.—Patent completed.

3141 L. CLOZEL, Parls. Tunning. Dated October 1.

3141 L. CLOZEL, Paris. Tunning. Dated October 1.

This consists in the employment of caustic potash or soda, sulphuret of sodium or hypochlorite of potash or soda, known under the name of cau-de-javelle, in place of the lime for preparing the skins for removing the hair.

—Patent completed.

-Patent completed.

3142 W. R. LAKE, Southampton-buildings. Drilling holes. (A communication). Dated October 14, 1868.

This consists in combining a series of obtuse angled or inclined cranks, in a given space, in such a manner as to operate all of them simultaneously. The obtuse angled or inclined crank consists of an inclined shaft provided at its ends with arms or pins which are parallel to each other, and form, with the shaft, an angle of about 135deg.

-Patent abandoned.

3143 J. H. CARTER, Brighton. Lubricating. Dated Octo-

ber 14, 1863.

This consists, chiefly, in constructing and arranging lubricating apparatus in such a manner that the oil or other liquid is, by the action of pneumatic pressure, kept at a uniform level in a cup or trough connected with a reservoir.—Patent abandoned.

reservoir.—Patent abandoned.

3144 W. R. Lake, Southampton-buildings. Spinning wool. (A communication). Dated October 14, 1868.

This relates to a machine in which the roving is fed at intervals to the twisting mechanism. The latter consists of a revolving tube whose speed is governed according to the amount of twist desired. The yarn or thread, after having been twisted, is taken up by spools placed on spindles, which are supported by rails, which receive an automatic motion by the action of a conical cam mounted on a longitudinally sliding snaft, in such manner that cops of the required form are produced with ease and rapidity.—Patent completed.

3145 J. G. JONES, Blaina, Monmouth. Setting minerals.

rapidity.—Patent completed.

3145 J. G. JONES, Blaina, Monmouth. Getting minerals, Dated October 14, 1868.

This consists in improvements in apparatus employed in getting coal, stone, and minerals. The hole to receive the press-like apparatus is formed by means of a jumping bar, having at its extremity a chisel-like cutting edge of considerably less size than the diameter of the hole required, and some distance up the stem of the tool, which is made tubular; two wings are formed on opposite sides of the stem, and having cutting edges corresponding with portions of the circumference of the hole required. Those wing cutters, following the central cutter, wedge the coal or mineral inwards and into the hole which has been cleared by the leading chisel edge. The tool is turned found between the blows which are struck upon it, as when an ordinary jumping tool is employed. The press-

like apparatus which is inserted into the hole is formed with a series of plungers on each side of it, so that the bearings on the opposite sides of the hole are entirely on the plungers, and no strain but that of the water under pressure comes on the frame of the apparatus, whatever be the form of the hole.—Patent completed.

3146 J. ROBERTSON, Glasgow. Transmitting power. Dated October 14, 1868.

This consists mainly in now or improved modes of

3146 J. ROBERTSON, Glasgow. Transmitting power. Dated October 14, 1863.

This consists, mainly, in new or improved modes of generating and heating or producing fluid currents for generating and heating or producing fluid currents for actuating motive power engines generally: also in new or improved modes of transmitting motive power to, in, and through, or by mechanism or engines constructed so as to have one actuating fluid of each motor introduced, forced, or injected, in the form of a jet or stream through an annular nozzle or other conduit, made so as to draw another or second fluid or fluids into and through the main duct, which is directed and applied so as to actuate the motive power engine or mechanism by its force and expansion. Also in new or improved modes of regulating the flow of the actuating or measured fluids to and from the cylinders of reciprocating motive power engines, fluid meters, or measuring machines, by forming the ports in and through the working surfaces of the cylinder and piston, so as to form also the induction or eduction valve or valves (with or without inducing action, or positively spent currents), and their fluid-tight working surfaces, and by giving the piston an oscillatory motion on its axis in the well known and proper sequential time and relative position to suit that of its own longitudinal reciprocatory motion, instead of the separate slide and other valves usually employed for the like purposes.—Patent completed.

3147 E LEACH, Rochdale. Lattices. Dated October 14

3147 E. LEACH, Rochdale. Lattices. Dated October 14

1863. This consists in making the ends of the metal ribs or bars of which the lattice is composed of improved shapes, and in employing connecting links for enabling the ribs to be readily jointed together in an efficient and economical manner. In one arrangement, both ends of each rib is formed similar to the link of a square chain, and the links are jointed together by connecting links formed of two pieces screwed or riveted together, or by links which, when placed in one position, can be put on and taken off, but when placed in another position, are properly jointed to the links of the chain without any screws or rivets. In another arrangement there are two pins as the end of each rib, and the ribs are connected together by orlinary connecting links held in their places by fastened cross-pieces or retaining bars.—Patent completed.

3148 J. ATKINS, Birmingham. Metallic tubes. Dated october 14, 1868.

October 14, 1868.

The inner or foundation tube is made of sheet iron or other metal by cutting out or porforating the sheet metal before it is made into a tube with any desired ornamental pattern, and the perforated sheet metal is afterwards made into tubing in the ordinary manner. The tube of brass, or other tube with which the foundation tube is to be eased, is then placed upon the said foundation tube and subject the compound tube to a drawing process.—Patent abandoned. doned.

doned.

3149 W. LORDERG, Brunswick-place, N. Treating cotton seeds. Dated October 14, 1868.

This consists in treating cotton seed with sulphuric acid, of a strength and in proportions varying according to circumstances, with agitation, by which the cotton is disintegrated. The disintegration having taken place, the glutinous matter is separated from the seed by the application of water, and the acid removed by an alkaline bath, and the seed rapidly dried by any suitable means. The refuse is employed for manure.—Patent completed.

3150 H. Hupson, Wolverhampton. Stapping trains.

buth, and the seed rapidly dried by any suitable means. The refuse is employed for manure.—Patent completed.

3150 H. Hupson. Wolverhampton. Stopping traiss.
Dated October 14, 1868.

Upon the engine, or other convenient part of the train, a buffer is fixed in any convenient position between the ordinary buffers, the first-named buffer protruding such distance beyond the ordinary buffers as may be desirable. This supplementary buffer is arranged so as to be drawn inwards when it is intended to "back" the train. Each carriage is provided with a horizontal rod, or its equivalent, running the length of the carriage, and protruding beyond the buffer beam at each end thereof. To the ends of this rod are attached dises or buffer heads, and the rod is in a line with the supplementary or first-mentioned buffer placed upon the engine, or other suitable part of the train, and it is so acted upon by springs, or their equivalent, that, on being pushed in either direction, and the pressure being romoved, the rod shall return to its former position. This rod may be connected with the ordinary brakes by gearing, and is so arranged by means of a spring, or its equivalent, that upon a certain pressure acting upon the brakes the rod may pass on, retaining the pressure, but not increasing it—Patent completed.

3151 W. B. Lake, Southampton-buildings. Burning wedgesgriet.

3151 W. R. LAKE, Southampton-buildings. Burning phrocarbons. (A communication). Dated October 14, hudrocarbons.

hydrocarbons. (A communication). Dated October 14, 1868.

This relates to that class of stores ordinarily denominated "petroleum stoves," in which naphtha, gasoline, or other like substance, is employed as fuel for heating and cooking. The invention consists in combining with a petroleum stove an apparatus for generating gas for illuminating purposes, the said apparatus being provided with a receptacle or meter for receiving the gas as it is produced from the naphtha, gasoline, or other fuel; also in attaching a lamp burner to the reservoir containing the said fuel. Second, the invention relates to certain improvements in apparatus for generating and burning gas from naphtha, chiefly for illuminating purposes, and also for heating a nursery lamp. Third, the invention relates to a burner fitted to the bottom of the gas pipe, so that when the gas is lighted the jet of flame will proceed downward, or from below, instead of from the top or side of the burner.—Patent completed.

3162 J. DENNY, Cheltenham. Coffeepots. Dated October 14, 1868.

It is proposed to form the upper and removable division



3153 G. C. GUMPEL. Leicester-square. Locks and latches.

3153 G. C. GUMPEL, Leicester-square. Locks and latches. Dated October 15, 1868.

This consists in the application of pins or sliders of any suitable section, passing through the bolt or bolts, or sliding-piece or pieces, acting on the bolt or bolts, and a fixed piece or bolt, guide, or pieces or guides, in or on which the bolt or bolts, or sliding-piece or pieces, moves or move. The pins or sliders which pass through the bolt or bolts, sliding-piece or pieces, bolt guides, and the bolt shifter, hereinefter described, are cut into such lengths, that when in a given position the divisions of the pins correspond to the divisions or sliding surfaces between the various parts, through which the pins pass, and in other positions only the bolt shifter, hereinefter described, can be moved whilst another part of the pin prevents the bolt from being moved. The pins can be moved into such positions as to enable the bolt to be shifted, either by pressing upon the exposed ends of the pins by the direct application of a key, or by means of intermediate tumblers, which latter are moved by a key.—Patent completed.

ploted.

8154 W. E. Gedde. Wellington-street, W.C. Artificial fuel. Dated October 14, 1868.

This invention consists in using as an agglomerating matter the pure vegetable resin produced by the germinating of the maritime pine, or other trees, or extracted by other means, and with or without any combination or addit ion of other materaglomerating. The effect desired to be produced is the absolute identification of the vegetable resin with the materials to be agglomerated. The single reser vation is the addition of the quantity of cold or boiling water, or of steam useful for preparing the materials, which is brought together, that is to say, the aforesaid slack and dust and the pure vegetable resin.—Patent completed.

pletecl.

515 5 H. A. Bonneyille, Paris. Einstie moulds. (A communication.) Dated October 15, 1868.

This consists in making a mould of such material or composition as to suit it especially to undercut work. Rubber, which has been properly prepared for vulcanization, is taken, and placed over a metallic pattern, and by means of back and front metal mould plates or fixtures, the pattern and rubber compound is securely enclosed, pressure being applied to the external surfaces to force the composition into the undercutting, in this way taking a perfect impression of the pattern. In this condition it is subjected to sufficient degree of heat, in the usual well known manner.—Patent completed

3156 E. Fort and J. Lee. Burnby. Furnace.

3156 E. FORT and J. LEE, Burnby. Furnaces. Dated October 15, 1863

October 15, 1869.
This relates to the construction and arrangement of the bridge of flue-fired boilers, and consists in constructing such bridge of a semicircular form, and extending towards the rear end of the flue, thus forming an arch within the flue, so that the heated cases are confined or throttled between the upper half of the flue and the bridge, and thus partially consuming the smoke; and the arch (which is constructed of firechy blocks, fireclay bricks, fron, or other suitable material), throws off or radiates heat.—Patent abandoned.

heat.—Patent abandoned.

3157 G. C. Attrace and T. Dermer. Wood-street, E.C. Fastening scarces. Dated October 15, 1868.

The buckle or fastener is constructed of any suitable metal, and consists of a plate, in which is formed a slot, one edge of such slot being bent or curved, so as to facilitate the entrance and passage of the band or tongue through the same. One edge of the buckle or fastener is provided with any desired number of curved points or teeth. The buckle or fastener is attached in an oblique or other suitable position to the body or foundation of the seart.—Patent abandoned.

3158 A Robins Great St Helen's E.C. Haten and

scarf.—Patent abandoned.

3158 A. Ronns, Great St. Helen's, E.C. Water and drain pipes. (A communication.) Dated October 15, 1868.

The invention relates to the manufacture of water and drain pipes of oakum, cordage, or other woven fabric or throus material, combined by cementing with pitch, tar, resin, asphalte, or other similar substance, and then coating the same within and without with the same material. In addition thereto a coating of brickdust, sand, coke dust, grit, or other suitable hard particles of matter, is applied as a protection to the surface.—Patent completed.

as a protection to the surface.—Patent completed.

3159 E. Peyton, Birmingham. Springmattresses. Dated October 15, 1868.

The chief object is to improve the mattress known as the "oriental mattress." The invention consists in sloping both sides of the frame down from the two ends, so that they are only two or three inches high at the middle, and for the purpose of supporting the outside spiral springs, of which the mattress is principally formed, as effectually as if they were fastened to the frame commonly in use, but in an unobjectionable manner, at each side of the mattress, an irou, steel, or wood lath is placed, running from head to foot, and attached to the springs, and which, without being fastened, is supported or held at each end by passelag into an aperture or recess formed in the frame, or into a loop of iron, wood, or other suitable material. fastened to the frame, or by some similar contrivance, so that, without being able to come out, it is free to work backwards and forwards, as required by the motion of the springs to which it is fixed.—Patent completed.

3160 T. Gray, Taibach, South Wales. Safety lamps.

backwards and forwards, as required by the motion of
the springs to which it is flaced.—Patent completed.

3160 T. Gray, Taibach, South Wales. Safety lamps.
Dated October 15, 1868.

The "poles," which, as in other safety lamps, support
and keep together the different parts, are hollow for the
purpose of supplying the flame with the necessary oxygen
to support combustion. These hollow or tubular poles
connect the extreme top and bottom of the lamp. At the
bottom the poles are screwed or let into a chamber, in which
the nir, after passing down the poles, circulates, and in
which there is a ring or washer of perforated metal or
gauze, through which the air passes to the flame. From the
flame the beated air and products of combustion ascend
the ordinary glass cylinder, and a metal chimney placed
in the wire gauze cylinder. The ring or washer of gauze
or perforated metal prevents the return up the hollow
poles of the ignited gas, while the lamp is surrounded by,
or is being used to, detect the presence of inflammable
than. A cap prevents dust entering the top of the hollow
poles. Instead of a wire gauze cylinder a close metallic
cylinder may be employed, having in the top a piece of
gauze or perferated metal, to allow the heated air and
products of combustion to issue.—Patent completed.

2141 J. and A. Ball, Nottingham. Lace. Dated Octoin the wire gauze explinder. The ring or washer of gauze or perforated metal prevents the return up the hollow poles of the ignited gas, while the lamp is surrounded by or is being used to, detect the presence of inflammable years. A cap prevents dust entering the top of the hollow poles. Instead of a wire gauze explinder a close metallic cylinder may be employed, having in the top a piece of gauze or perforated metal, to allow the heated in and products of combustion to issue.—Patent completed.

2161 J. and A. BALL, Nottingham. Lace. Dated October 16, 1868.

This consists, first, in manufacturing new or peculiar ground or net in bobbin, net, or twist lace machines, in

which, on each pillar or hole, one or more extra twists to that or those usually given in making ordinary lace or net, is or are placed. The work is "taken up" with the point bars, every motion of the machine using a double set of points on each point bar—that is to say, for instance, in a 10 point machine 20 points are employed, points of various lengths being used as may be required; in an 11 point machine 22 points are employed; in a 12 point machine 24 points are employed; and so on, double the number of points to the actual gauge of the machine being used. Also, in manufacturing on such ground or net spots, spriga, or other devices.—Patent abandoned.

3152 R. M. Wood. Stoke Newington. Type cases, &c. Date: October 15, 1868.

This consists in constructing type cases, work boxes, and other articles having compartments, by making the partitions, which form the compartments, in one piece, without joints, seams, or attachments. A slab or block of wood of the desired length and breadth, and of a thickness suitable for obtaining the desired depth of the compartment, being traced thereon, or on a pattern of paper, or other material laid thereon, aguare, cubical, or otherwise shaped portion of the block or slab of wood, corresponding with and leaving the required cavities, recesses, or openings, to form compartments, are cut away, and necessary portions of the wood left to form the sides, boundaries, or partitions of the said compartments.—Patent completed.

3163 J. A. A. Vacherot, Notting-hill. Beams and girders Dated October 15, 1868.

It is proposed to roll or cast the girder or beam in the form of a single or double trough, the single trough being combined with a vertical web extending longitudinally. In constructing a floor and ceiling according to this invention, two separate and independent sets of beams or girlers are employed for supporting the flooring boards and cellings.—Patent abandoned.

girlers are employed for supporting the flooring boards and cellings.—Patent abandoned.

3164 W. R. Lake, Southampton-buildings, Chancerylane. Gans. (A communication.) Dated October 15, 1868.
This consists in the construction of a gun with a cylinder, formed with any given number of chambers, from which the powder and balls are discharged, which gun is charged with loose ammunition and arranged in such a manner that it is loaded automatically by gravitation, and will discharge in volleys any number of single balls, slugs, or cases of shot. The gun is constructed in such a manner that all the charges of a volley may be discharged simultaneously by the explosion of one cap. The machinery of the gun, which is encased in steel plate, is proof against small arms, and rests upon a pivot, which enables the gunner to direct his fire with ease and precision. The gun is so constructed that it can readily be placed on any kind of carriage, of suitable strength, which may be drawn by horses, or otherwise. It is well adapted to fortifications, in case of an attack by storm, or on vessels, and any place where it may be desired to fire a number of shots in quick succession, as it will discharge 120 volleys per minute with unerring certainty.—Patent completed.

3165 W. R. LAKE, Southampton-buildings Chancery. tne. Breech-loaders. (A communication.) Dated Oc

lane. Breech-loaders. (A communication.) Dated October 15, 1868.

This relates to breech-loading firearms which carry magazines for holding fixed ammunition, and are provided with mechanism for automatically feeding each cartridge in succession, from the magazine into the barrel, into position for firing. In this invention, the magazine is charged through the breech frame, and also in that the feed bar is made detachable from the magazine and is moved entirely away therefrom when the magazine is to be charged, leaving the cartridges free to slide down the magazine from the breech frame. The invention also relates to the construction and arrangement of the hammer mechanism for exploding the cartridge within the barrel,—Patent completed. -Patent completed.

—Patent completed.

3166 T. Vicars and T. Vicars, jun., and J. Smith.
Liverpool. Funaces. Dated October 16, 1868.

This relates to that class of self-feeding smokeless
furnaces wherein a progressive motion is given to the
fuel, and consists, first, in feeding the fuel directly on to
and preferably into and amongst the burning mass, at a
suitable distance above the firebars, instead of from above.
Second, in immersing the lower edges or under sides of
the whole or part of the furnace bars in water, with the
object of making them last longer, and to prevent the
adhesion of slag or clinker. Third, in forming furnace
bars, the lower edges or under sides whereof are immersed
in or dip into water, with cavities or passages, through
which water is allowed to circulate or flow from the
troughs.—Patent completed.

3167 R. Pearce, Swansea. Separation of copper. Dated

3167 R. PEARCE, Swansea. Separation of copper. Dated

3167 R. Pearce, Swansea. Separation of copper. Dated October 16, 1863.

This relates especially to the purification of silver which has been precipitated from any of its salts, such, for example, as sulphate, nitrate, or chloride of copper. The impure silver, or compounds of silver and copper, is placed upon a perforated disc in a boiler. Water is added, together with a small quantity of sulphuric acid, the proportion of the latter necessarily varying with the amount of copper or other impurities present, as will be well understood. Steam, with atmospheric air mineled therewith, is then admitted, by means of any suitable injecting apparatus. Violent chullition cassues, and the copper becomes oxidized, and is dissolved by the sulphuric acid. Should the chullition become too violent, it may be checked by admitting less air. After being boiled in this way for about two hours, the solution of sulphate of copper is drawn off, the silver stirred so as to make it a little more granular, a fresh supply of water, which has been slightly acidulated with sulphuric acid, is added, and the mixture is then boiled for about one heur. The solution is afterwards drawn off, and the silver carefully washed with clean water. The silver, when dry, has only to be melted in crucibles, for fine silver refining in the usual way, by means of lead, being quite unnecessary.—Patent completed.

locomotive passes over the rail the tube gives and allows the rail to take its seat on the bearer.—Patent completed.

3169 W. C. CHUBCH, Derby. Steam engines. Dated October 16, 1868.

3169 W. C. CHURCH, Derby. Steam engines. Dated October 16, 1868.

This relates to a previous patent, dated July 6, 1867 (No. 1974.) The present invention relates, in the first place, to arrangements for removing the pressure of steam from the backs of slide valves, and consists in forming a circular groove in that face of the cap or ring which works against the division plate, so as to intercept or cut off any steam that may leak past the outer portion of the face of the cap or ring, such leakage being taken from the said circular groove, through one or more small holes, to the Inside of the cap or ring, and from thene by small holes at the inner edge of the cap or ring, to the space between the cap or ring and the division plate. The said cap or ring is made with only one cylindrical flange or projection at its outer edge, instead of two (one on each edge), as in the invention above referred to, and the inner surface of the said flange or projection is conical in form. In the second place, to improvements in pistons, described in the specification of patent above referred to, and consists in dispensing with one inner ring, therein described, and in using segmental pieces, straight on one side, to cover the joints of the packing rings acting against the cylinder; also in inserting two packing rings at own k against the inside of the cylinder, and in foreing these two rings apart against the junk ring and piston head by means of an elastic collapsing ring, straight on one side and bevelled on the other. In the third place, to improvements in safety valves and apparatus for preventing damage and accidents in steam boilers. With reference to safety valves, the invention consists in making the outlet for the escaping steam of annular form, and in covering this with an annular or ring valve, held down as required either by a weight or rweights, or by a weighted lever or by springs.—Patent completed.

3170 R. HEAD, Gray-street, W. Stoves and boilers. Dated

3170 R. Hear, Gray-street, W. Stores and boilers. Dated October 16, 1868.

Stoves and boilers are constructed so as to be fitted into a recess of the same or similar form and character to that now usually provided for ordinary open firegrates. First, a stool or support is provided (which is to be placed and stands upon the hearth or bottom of the recess) and on this stool the bottom bars of the grate and also the front bars, like those of an ordinary open fireplace, are carried. This stool or support fits the recess, and is flat on the top with the exception of two broad uprights on its front corners, which sustain the front of the boiler, and the front bars of the stove are between these uprights. Second, the boiler is formed so as to fill up the whole of the recess which is above the stool or support, except a space of a few inches along the top of the boiler, being made deeper at back than in front, so that all along the back it stands upon the flat top of the stool or support, leaving towards the front a space for the fire, extending from side to side of the recess.—Patent completed.

3171 W. E. Newton, Chancery-lane. Surup and sugar

3171 W. E. NEWTON, Chancery-lane. Surup and sugar A communication). Dated October 16, 1868.

from side to side of the recess.—Patent completed.

3171 W. E. Newton, Clancery-lane. Surup and sugar (A communication). Dated October 16, 1868.

First, for the extraction and preparation of the substances to be saccharified, starch is made from grain in the usual and well-known manner, taking care, however, to obtain as much cellulose as possible. In this respect, the process somewhat differs from the usual methods of making sugar syrups from grain or potatock, as that part of the grain which is starch is not only employed, but also other parts, principally the woody fibres of the grain. Having obtained the coarse starch and cellulose, &c., these substances are mixed with warm water, either not acidulated or only slightly acidulated with sulphuric or tartaric acid, in the manner hereinafter described. The mixture above described is put into the boiling vessel, and after hermetically closing the vessel, it is submitted to a high heat of not less than 325deg. Fah. The sweet liquor is drained from the vessel, and as (in any case) there must be always at least traces of acid, it is saturated with carbonate of lime, which is the first but imperfect neutralization. The liquor is then filtered through bag filters, and submitted again with tine bone dust, and sometimes with prismatic sugar, to the action of the great heat in the boiling vessel. It is filtered again and concentrated to 204eg. Beaume cold, and allowed to stand in a receiver at a heat not less than 120deg. Fah. It is then illered, through animal charcoal, and neutralized again at the same time by pure hydrate of soda. This second neutralization renders the liquor entirely free from any acid, and thus favours crystallization. The liquor is holled to about 38deg. Beaume cold, and allowed to crystallize in large moulds. The patentee explains the working rules of the method of using the apparatus hereafter described, which is to be employed for boiling.—Patent completed.

3172 J. Sherman, Whitechapel. Finger rings. Dated

3172 J. SHERMAN, Whitechapel. Finger rings. Dated October 16, 1868.

October 16, 1905.

Finger rings are made in several parts or hoops (preferably three in number), each hoop being set with stones, which, when the several parts of the ring are united together, will form a cluster.—Patent completed.

# APPLICATIONS FOR LETTERS PATENT

Dated April 20, 1869.

1202 L. Goetz, of Leith, Midlothian. An improved pre-gration of materials for cleansing wool, cotton, linen, and other like fibrous substances.

1203 A. Brady, Maryland Point, Stratford, Essex. Pro-ducing pure iron direct from crude iron ore. 1204 F. W. Follows and J. Bate, Manchester. An im-proved apparatus for sweeping carpets, floors, lawns, and other surfaces.



1209 W. E. Gedge, Wellington-street, Strand. An proved water meter. 1210 K. S. Mackenzle, Baronet, Gairloch, Ross. North ritdin. Improvements in fences, railings, hurdles, and

looms

hritsin. Improvements in Johnson 1211 H. Lee, Manchester, Certain improvements in 2018 R. Lee, Manchester, Certain improvements in 2018 G. Green, Aberystwith, Cardiganshire. Improvements in apparatus for separating ores and other certain apparatus for separating ores. ments

ments in apparatus for separating ores and other materials.

1213 W. R. Lake, Southampton-buildings, Chancery-lane. An improved toy.

1214 M. Andrew, Southampton-buildings, Chancery-lane. Improvements in vessels for containing oil or other liquids, and in devices for drawing the contents from the same.

1215 W. R. Lake, Southampton-buildings. Improve ments in lamps.

1216 W. R. Lake, Southampton-unitings. Improvements in lamps.

Dated April 21, 1869.

1216 W. F. Reynolds, Albert-square, Commercial-road East, Middlesex, and J. A. Mays, West-street, Finsbury-circus, City. Improvements in velocipedes, and other vehicles or carriages mounted on running wheels.

1217 W. Holloway, Portland-place North, Lower Clapton, Middlesex. Improvements in apparatus for the manufacture of beverages from cocoa nibs, cocoa powder, paste, or other similar substances.

1218 J., J., and W. Fletcher, Eagle Foundry, Salford. Improvements in lubricating the wheels of velocipedes and other wheels and pulleys.

1219 P. R. Hodge, Adam-street, Adelphi, Westminster. Improvements in the manufacture of cloth or compound fabrics or artificial leather, and in the application of such to certain purposes. to c ertain purposes. 220 E. O. Catrin, Boulevard Bonne Nouvelle, Paris.

1220

1220 E. O. Catrin. Boulevard Bonne Nouvelle, Paris. A novel application of a key to act as a cock at the upper part of bottles, demi-johns, and analogous vessels.

1221 B. Picard, Ivry, Department of the Seine, France. Improvements in towing with sunk chains applicable to the navigation on all rivers, and streams of water, of whatever depth.

1222 J. W. M. Carter, Foyle-street, Londondorry. Im-

whatever depth.
1222 J. W. M'Carter, Foyle-street, Londonderry. Improvements in condensers for steam engines.
1223 T. C. Bull, Weobley, Herefordshire. An improvement in the manufacture of boots or shoes.
1224 M. Henry, Fleet-street, City. An improved mode of obtaining pyro-phosphate of lime.
1225 H. C. Mayer, Craven-street, Westminster. Improvements in velocipedes.
1226 M. Pletts, Newcastle-on-Tyne. Improvements in oil feeders.

1226 M. Pletts, Newcastle-on-Tyne. Improvements in oil feeders. 1227 C. D. Abel, Southampton-buildings, Chancery-lane. A new or improved method of, and materials for, the pre-

A new or improved method of, and materials for, the pre-paration of mural paintings.

1228 C. M. Barker, Kennington Park-road, Surrey. Improvements in steam generators.

1229 W. Johnson, Elms, Sketty, Swansea, Glamorgan-shire. An improved system of communication between railway passengers and the guard and engine driver of a train.

train.

1230 C. E. Brooman, Fleet-street, City, patent agent. Improvements in dressing or finishing fabrics. (A communication).

1231 W. Robinson, Gospel Oak Iron Works, Tipton, Staffordshire. Improvements in the manufacture of thin sheets or plates of steel or of steel and iron.

1232 J. H. A. Bleckmann, Solingen, Prussia. Improvements in firearms.

1233 J. Francis, J. Donaldson, and G. Reavely, Galashiels. Improvements in locking apparatus used for rallway sidings to prevent trucks or other carriages passing out from the sidings.

Dated April 22, 1869.

Dated April 22, 1869. 1234 J. Holding, Manchester. Improvements in looms

G. Danis, Rochdale, and J., T., R., and S. Stott, e., near Rochdale. Certain improvements in cardr weavii 1235 (1.

1235 G. Dania, Rochdale, and J., T., R., and S. Stott, Wardle, near Rochdale, Certain improvements in carding engines.

1236 H. T. Lewis and W. White, Handsworth, Staffordshire. An improved mode of hanging or suspending sash frames.

1237 J. Eccles, Black-lane, Radcliffe, Lancashire. Improvements in apparatus for lessing warps in machines called slashers.

called slashors.

1238 G. White, Queen-street, Cheapside, City. A ship-weir or movable dam for cleaning and appropriating the bed or course of rivers or other running navigable

streams.
1239 W. Catchpool, Goswell-road, Middlesex. Im-

streams.

1239 W. Catchpool, Goswell-road, Middlesex. Improvements in the treatment of hay and straw.

1240 J. C. Ridley, Newcastle-upon-Tyne. Improvements in treating waste rails, tyres, ingots, crop ends of rails, and other scrap of Bessemer and similar steel, in order to utilize them.

1241 M. Hillary, Andover, Hants. Improvements in harrows or drags.

1242 G. G. Tandy, Anerly-road, Penge, Surrey. Improved apparatus for carburetting air or gas.

1243 A. Borgnet, Swansea, Glamorganshire. An improved composition to be employed as a paint.

1244 A. Borgnet, Swansea, Glamorganshire. Improvements in the manufacture of paint.

1245 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in apparatus for effecting communication between the passengers and guard, or between the guard and driver of a railway train.

Dated April 23, 1869.

Dated April 23, 1869.

1247 W. Palliser, Pall Mall, and T. English, Wandsworth, Surrey. Improvements in screw bolts, bolt holes, nuts, and washers for armour-plated structures.

1248 N. Wilson, High Holborn, Bloomsbury. Improvements in velocitedes.

1248 N. Wilson, High Holborn, Bloomsbury. Improvements in velocipedes.
1249 G. White, Queen-street, Cheapside, City. An improved motive power.
1250 W. A. Lyttle, The Grove, Hammersmith, Middlesex. Improvements in voltaic batteries for telegraphic and other purposes.
1251 G. T. Bousfield, Loughborough Park, Brixton. Improvements in sheep washing apparatus.
1252 S. Smith, Derby. An improved axle and axle-box for railway carriages and waggons.
1253 W. B. Dick, Glasgow. Improvements in apparatus for extinguishing fires.
1264 J. Whittaker, Sun Iron Works, Oldham. Improvements in machines for moulding wheels.
1255 H. E. Newion, Chancery-lane. An improved

mode of, and apparatus for, preventing the bursting of

mode of, and apparatus for, proventing the bursting of steam boliors.

1256 H. E. Newton, Chancery-lane. Improvements in puddling fron.
1257 T. Wilson, Birmingham. Improvements in cart-ridges for breech-loading firearms.
1258 E. Tatham, Nottingham. Improvements in the construction of levers and of nebs or thread carriers for warm machines.

warp machines.

1259 E. M. Rellly, New Oxford-street, Middlesex. Improvements in explosive bullets, and in the apparatus for

making them.

Dated April 24, 1869.

1260 J. Major and W. Wright, Swallow-street, Middlesex, and G. H. Jones, Alpha-road, Middlesex. A new of improved manufacture of white lead, and apparatus em-

improved manufacture of white lead, and apparatus employed therein.

1261 J. Thompson, Great Nelson-street, Liverpool.

Working all kinds of machinery to any required power without fuel or labour.

1262 H. Reed, Edgbaston, Warwickshire. A new or improved pneumatic apparatus for expanding or distending French letters.

1263 A. Muir, Britannia Works, Strangeways, Manchester. Improvements in stocks and dies for screwing bolts and other articles.

1264 J. and B. Weigel, Rne Montmatre, Paris, Improvements in the manufacture of shirt studs and solitaires.

provements in the manufacture.

1265 B. Foster, Liscard, Chester. Improvements in machinery for crushing and pulverizing.

1266 J. Head, Axminster, Devonshire. Improvements in harrows for working or cultivating the soil.

1267 S. Brooke, Brighouse, Yorkshire. Improvements in, or applicable to, machinery or apparatus for carding and otherwise preparing wool or other fibrous substances for spinning.

or spinning.

1268 J. Crabtree, Sheffield. Improvements in machinery or cutting shives, bungs, corks, spiles, or other taper.

pegs.

1269 C. D. Abel, Southampton-buildings, Chancery-lane.

Improvements in velocipedes.

1270 P. Jensen, Chiswell-street, Finsbury-square, Middlesex. Improvements in sewing machines with rotary spoolhook for protecting spoolhook and bobbin from damage, and for preventing breakage of thread and pacilla.

1271 D. A. S. Mackintosh, Glasgow. A new or improved

needle.
1271 D. A. S. Mackintosh, Glasgow. A new or improved cask spile.
1272 A. Jack, Maybole, Ayrshire. Improvements in reaping and mowing machines.
1273 A. Clark, Chancery-lane. Improvements in reaping and mowing machines.
1274 J. Cudbird, Hingham, Norfolk. Improvements in motive power machinery.
1275 O. Engholm, Edinburgh. Improvements in the preserving of articles of food, and in the mechanism or apparatus employed therefor or connected therewith.
1276 O. Engholm, Edinburgh. Improved means, apparatus, and mechanism for retaining caught fish in life for market, applicable also for other purposes.
1277 J. Scharr, Leith, Scotland, Improvements in the manufacture of liquid soap.
1278 T. Forster, Streatham, and P. B. Cow, Streatham Common. Improvements in compounds containing india-rubber, gutta-percha or balata, and in the manufacture of such compounds.
1279 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in the construction of axle-boxes for railway carriages and other vehicles.

Dated April 26, 1869.

railway carriages and other vehicles.

Dated April 28, 1869.

1280 G. White, Queen-street, Cheapside, City. An improved apparatus for carding tow.

1281 I. Farrell, Clanbrassil-terrace, South Circular-road, Dublin, and W. Turner, Hammersmith Iron Works, Dublin. Improvements in velocipedes.

1282 A. Watson, Newington Green-road, Middlesex. Improvements in sleeve links, solitaires, glove fasteners, and other similar articles or fasteners.

1283 J. Cunningham, Harpford, near Ottery St. Mary, Devonshire. An improved machine or apparatus for cutting sandwiches or bread alone.

1284 H. Hall, Burton-on-Trent. Improvements in obtaining motive power, and apparatus therefor.

1284 H. Hall, Burton-on-Trent, Improvements in obtaining motive power, and apparatus therefor.

1285 J. K. Broadbent and S. and J. Prestwich, Farmworth, Lancashire. Improvements in the arrangement and construction of steam boiler and other furnaces for economizing fuel and labour and consuming smoke.

1286 J. Smith, Stanley-terrace, Rathgar, Dublin. Improvements in self-acting signal apparatus for preventing collisions on railways.

1287 A. V. Newton, Chancery-lane. An improved reversible parasol.

1288 W. E. Newton, Chancery-lane. Improvements in steam generators and condensers.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS. From the "London Gazette," April 27, 1869.

2014, April 27, 1869.
2004 J. Palmer
2005 G. Tidcombe
3008 S. Smart
2015 B. Norton
2016 W. E. Gedge
2022 G. Lowry
2025 W. E. Gedge
2022 W. E. Gredge
2024 W. Ehrhardt
205 S. Bateman
205 J. H. Johnson
2018 J. H. Johnson 8765 W. Dawes and E.A. | Ramsden 3765 W. Dawes and E. A.
Bamsden
3778 C. Ellison and E.
Parkinson
3802 J. H. Brown
3805 H. Williamson
3806 A. Baumann
3813 M. Brown-Westhead
and E. Smith
3837 G. Hadfield
3838 F. Robert-Theurer
3847 B. Hallimond
3850 C. Liebermann and
C. Grache
3853 J. W. Brierley
3856 E. S. Griffiths
3859 S. Remington
3864 E. Pavy and J. Clark
3870 P. Spence
3873 J. Dickson
3879 R. Wilson
3879 R. Wilson
3879 R. Wilson
3879 R. Wilson 20 S. Bateman
83 J. H. Johnson
97 S. Jellyman
284 J. H. Johnson
375 C. D. J. Seitz
491 F. J. Knewstub
592 M. M. Lennan
594 T. Moore
600 J. Townsend
623 W. Simpson and A.
Gardner
690 W. A. Gilbee
909 G. Wells
1025 F. Tommasi
1062 W. T. Eley
1086 W. W. and J. D.
Hooper and
Drummond
1136 J. H. Johnson
1194 H. A. Bonnevilla 3879 B. Wilson 3890 J. E. Massey 3885 L. A. W. Lund and E. Axmann 3993 W. E. Gedge 3894 P. G. Jarre 3895 W. E. Gedge 3896 J. Breeden 3896 G. Ritchia

# LIST OF SEALED PATENTS. Sealed April 23, 1869. 3044 G. Graveley 3279 F. Ransome 3249 R. Ferguson and G 3283 G. Zanni

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Lord	3289 J. Wallace
3267 P. M. Crane	3291 J. John∗on
3269 B. Nicoll	3312 J. and W. Adams
3274 W. Boulton	8324 J. Bronner
3276 T. Speight and W.	3539 C. D. Abel
H. France	37 A. W. C. Williams
3277 T. Priestley and W.	559 J. Breeden
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3296 M. A. Soul	3436 P. J. Livsey
3305 M. Benson	3451 C. Markham and W.
3308 F. A. Blanchon	Knighton
3318 W. Collins .	8458 C. Markham and W.
3328 B. Dickinson	Knighton
3334 J. Dannatt and T.S.	3573 H. E. Newton
Turnbull	8575 E. R. Wethered
3339 J. A. R. Main	3745 W. Baines
3347 E. Holden	8829 J. Worrall and J.
8353 S. Ward, W. Hurst,	Kershaw
and J. Tuer	3830 T. Aveling
8372 J. Parrott and W.	173 C. Baunscheidt
Jones	339 J. Howard
3376 W. Biker	604 W. A. Herring
3380 A. M. Clark	660 T. Greenwood
3435 T. B. Collingwood	752 T. Greenwood
and W. Hardman	2. 3. 3. 3. 4. 004,
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PATENTS ON WHICH THE STAMP DUTY OF £50

HAS BEL	N PAID.
8 A. A. L. P. Cochrane	1168 G. E. Noone
6 D. Evans	1170 T. Kirby
6 J. Leigh	1196 T. A. Weston
4 J. H. Wilson	1215 G. Davies
6 G. E. Donisthorpe	1278 W. Young and P.
9 D. Bievez	Brash
2 A. Upward and A. A.	1305 C. Moseley
Cochrane	-
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PATENTS ON WHICH THE STAMP DUTY OF £100

HAS BEEN PAID.

1199 J. F. Allen
1201 F. Dangerfield
1214 J. Elder

PATENTS ON WHICH THE STAMP DUTY OF £100

1219 J. F. Alleyne
1470 J. Stone

LIST OF SPECIFICATIONS PUBLISHED For the week ending April 24, 1869.

No.	Pr		No.	Pr.	No.	F	r.	No.	P	T.	No.	I	r.	No.	ו	Pr.
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2790	0	4	2845	0 4	13861	0	-8	2874	1					5505	0	8
2791	0	4	2846	0 4	12862	0	4	2875	1	-0	2890	0	4	2903	0	4
2798	1	2	2847	0 10	2863	1	0	2876	0	10	2891	0	4	29414	1	4
2829	0	4	2848	0 4	12864	2	0	2877	0	10	2892	0	4	2905	0	8
2833	0	4	2849	0 6	52865	0	4	2879	0	10	2893	1	(	2907	0	4
2834	0 1	lo	2850	0 4	12866	2	2	2850	0	4	2894	1	6	2908	0	6
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NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequences of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remitance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in pestage stamps, for sums above that amount a Post Office MoneyOrder should be sent, payable to ROBERTSON, BROOMAN, and CO, Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

PROVISIONAL PROTECTION FOR SIX MONTHS
Has been granted upon Specifications bearing the following numbers:—

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3765	949	1063	1098	1108	1124	1142	1156	
<b>38</b> 93	955	1064	1092	1110	1126	1144	1158	
407	971	1076	1094	1112	1128	1146	1162	
669	979	1078	1096	1114	1130	1148	1164	
869	1005	1080	1098	1118	1134	1150	1166	
891	1035	1082	1102	1120	1136	1152	1168	
935	1047	1084	1106	1122	1140	1154	1170	
947	1053	1086						
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SCIENCE AND ART.—A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one conce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelet's Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. The sepamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to Science and ART .- A striking instance of the those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require have it forwarded with perfect safety. [ADVY.]



THE

# MECHANICS' MAGAZINE.

LONDON: FRIDAY, MAY 7, 1869.

## STEAM BOILER EXPLOSIONS.

THERE is no subject upon which we have written more than that of steam boiler explosions. These occurrences are denominated "accidents," but long past ex-perience has taught us that they almost invariably owe their origin to either faulty construction, bad working, or careless and inefficient tending. "Accident" is the convenient term under which steam users often obtain absolution from culpable carelessness, or even wilful and criminal neglect. As matter stand at present, boiler makers can palm off bad boilers on the public, and steam users employ them with the certainty that when they explode with fatal consequences they will, by the help of a coroner and his jury, be publicly absolved from all responsibility, and the event proclaimed to be "accidental." We have said frequently before, and we again repeat, that the causes of explosion are so simple, their results so fatal, and their occurrence so frequent, that it is high time some action was taken to secure common sense investigations into these matters. The Manchester Steam Users' Association has done very much, through their engineer, Mr. L. E. Fletcher, in exposing the fallacy of the present system of investigation. At the last annual general meeting of its members, as well as at the previous one, attention was called to the unsatisfactory character of the inquiries conducted by coroners with regard to fatal boiler explosions, and to the erroneous verdicts returned. It was also shown how important it was that this evil should be corrected, and sound information disseminated in every case, in order to check the loss of life and suffering at present recurring week by week, and at the same time render unnecessary any Governmental action, which might prove an interference with the free-dom of the steam user. With this view, resolutions—which have appeared in our columns—were passed at both of those mectings, requesting the committee to take the necessary steps to secure these investigations being rendered more satisfactory, so that the truth might be fully arrived at and plainly spoken in every case. In order to place the matter prominently before the public, a paper upon the subject was read at the last meeting of the British Association. Following this, at the annual general meeting of the Steam Users' Association, held on March 9 last, it was proposed that the attention of the Government should now be drawn to the subject, and that a deputation should wait upon the Home Secretary with a memorial.

Thus far, this useful Association had pro-posed. Now came the time to act; and we find that no time was lost in carrying out the proposition. At the following meeting of the Executive Committee, a memorial was submitted for approval, discussed, and adopted. Mr. Thomas Bazley, M.P. for Manchester was at once communicated with, and his assistance in the matter requested; and through his good offices, a deputation of the Association had an interview with Mr. Bruce, the Secretary of State for the Home Department, on Friday, April 16. A sudden and severe attack of illness prevented Mr. Fairbairn, the President of the Association, accompanying the deputation. It consisted of three of the vice-presidents, Mr. Thomas Bazley, M.P., Manchester; Mr. Hugh Mason,

M.P., of Bolton, Corresponding Member, and Mr. L. E. Fletcher, Chief Engineer. Mr. Bazley introduced the deputation to the Home Secretary, and briefly called at-tention to the serious loss of life and suffering entailed by steam boiler explosions. He pointed out that this was preventible, and explained that it was the wish of the memorialists that coroners should be empowered and instructed to command the attendance of eminent engineers to give evidence, when conducting enquiries, in consequence of these sad disasters, so that light might be thrown on the subject, and greater care induced: by which means, it was thought that the loss of life and property now occurring would be much lessened, if not altogether prevented. Mr. Bazley concluded by presenting Mr. Bruce with the memorial, which we shall now proceed to notice.

We have often had occasion to observe that it is entirely in the hands of steam users whether they will, by the exercise of common sense and ordinary discretion, save themselves from Government interference and control. or whether, by persistently pursuing a short-sighted and danger-fraught policy, they will continue to court that supervision which they would be the first to most strenuously resist. Nor would we wish to see such a system established. Nor does the Steam Users' Association desire this. On the contrary, the object the memorialists have in view is not to promote a system of Governmental periodical boiler inspection, to which manufacturers entertain a strong feeling of repugnance, and which the Association was originally founded to prevent. But the object is to so improve coroners' inquiries with regard to boiler explosions, that sound views with regard to the causes of these disasters may be disseminated, and all mystery with regard to them dispelled. Boiler explosions would be prevented, and further Governmental interference would be rendered unnecessary, if only faithful investigation and plain speaking were made compulsory. And the way in which this is to be accomplished is clearly set forth in the memorial. That important set forth in the memorial. That important document first points out the constant loss of life and the suffering arising from steam boiler explosions. At the present time, nearly 50 explosions occur on an average every year, explosions occur on an average every year, killing from 60 to 70 persons, and injuring as many others. Many of the persons killed and injured are breadwinners, so that not only do they suffer, but a great many others are rendered more or less destitute. The number of persons killed every year by boiler explosions exceeds the number of passengers killed on all the railways throughout the United Kingdom. From the return published by the Board of Trade, it appears that during the last six years 123 passengers were killed while during the same period 390 persons were killed by boiler explosions, the annual average of lives lost being from 20 to 21 in the case of railway passengers, and of 65 in consequence of boiler explosions. Thus it will be seen that for every passenger who loses his life by railway travelling, three persons are killed by boiler explosions.

Such are the results. Now as to the cause and this, as shown by the memorial, is summed up in one short word-neglect. system of voluntary periodical boiler inspec-tion carried out by the Association for the last fourteen years has proved fully adequate to the prevention of explosions; not a single boiler ever guaranteed has exploded. The constant investigations of boiler explosions have shown that much unnecessary mystery has been attached to the subject of steam boiler explosions, and that they all arise from the simplest causes, and could readily be prevented. As a rule, boilers burst simply because they are bad. Bad either from

follow that if people will have no care for themselves, no one ought to care for them. But the suffering does not always fall on the careless ones. Death is dealt around amongst the innocent, whilst the guilty are generally absolved, even from blame. It is for and on behalf of the real sufferers that the Association interferes, and by the memorial shows coroners' investigations, with regard to steam boiler explosions, to be incomplete, and the verdicts delusive. It is not as an institution that the coroner's inquest is condemned, but it is the manner in which it is practically carried out to which the strictures in the The next point is, how this be met. The plan recommemorial refer. difficulty is to be met. The plan recom-mended for adoption in the memorial is simply that every coroner should be both empowered and instructed, when conducting an inquiry consequent on a fatal steam boiler explosion, to avail himself of the assistance of two competent engineers, having no connection with the works at which the explosion occurred. These engineers are to visit the scene of the catastrophe, investigate the cause of the explosion, and report to the coroner thereon, their reports—which may be either joint or several, as most convenient -to be accompanied with explanatory scaled drawings, showing the original construction of the boiler, and, as far as possible, the lines of rent, as well as the direction in which the fragments were thrown, and the distances at which they fell. The engineers to attend the inquest, and assist the coroner in his examination of witnesses, as well as to give evi-Further, dence themselves before the jury. in order to secure to the public the full advantage of the investigation, the engineers' reports, with the drawings, to be printed and deposited in the Patent Office, and to lie there for inspection and purchase, as in the case of specifications of inventions. Also copies of these reports to be forwarded to the members of both Houses of Parliament, as in the case of reports on railway accidents.

Such a course of procedure would primarily result in the accumulation of a mass of very valuable information. But beyond this-and what is of the highest importance the responsibility of every steam boiler explosion would be brought home to the right party. This would render any further Governmental action unnecessary, and very shortly put an end to steam boiler explosions, simply by the force of truthful investigation and plain speaking. The fact is not lost sight of that many coroners have already the power—of which, in some cases, they avail themselves—of remunerating competent scientific witnesses, and which proves of considerable public service. But such is not the case in every instance, and coroners to whom the plan proposed in the memorial has been mentioned, have stated that it would prove of considerable assistance to them in conducting their investigations on such technical subjects as boiler explosions, and that they should be glad to see it brought into operation.

In his reply to the memorial, Mr. Bruce appeared to fear that there might be some partiality in affording to boiler attendants a Governmental investigation on the occurrence of fatal disasters, without extending that protection to railway passengers and colliery workers. But it should be remembered that the very protection now sought for boiler attendants is already enjoyed by railway passengers and colliery workers, while the boiler attendant is left unbefriended, so that the partiality anticipated already exists to the neglect of the poor stoker, while the tendency of the Association's proposition would be, not to create a partiality, but to remove one already existing. The plan recommended is, in fact, simply an extension to boiler at-Ashton-under-Lyne; and Mr. John Penn, because they are bad. Bad either from tendants of the privileges enjoyed by railway original malconstruction, or bad from the caster, M.P., Wigan; and Mr. Thos. Schofield, Manchester, members of the Executive Committee; as well as of Mr. John Hick, and the preventive simply care. It would sent down to make an investigation, and

report to the Board of Trade thereon, his report being presented to the members of both Houses of Parliament, and open to the purchase of the public; while, in addition, he attends the coroner's inquest, and assists in the examination of witnesses. In the event of a colliery explosion, a Government mining inspector is present at the inquest, and assists the coroner in conducting his inquiry; while an annual return of colliery explosions is published. In the event, how ever, of a boiler explosion, though the subject is one of a technical character, and on which a good deal of misapprehension exists, while questions arise with regard to it which may fairly be considered as beyond the province of what is technically termed "common knowledge"; yet boiler attendants are left without the protection of a satisfactory investigation of the cause of the catastrophe, and evidence from incompetent parties, or from those interested in suppressing the facts, is accepted, and, consequently, as so often stated, the truth is seldom arrived at and seldom spoken.

It will be seen, from what we have stated, that some action is needed to redress the present inequality, and afford to boiler attendants the privilege of as unbiassed an investigation as is now secured by the Crown to colliery workers and railway passengers. The initial movement in this action is now being taken by the Manchester Steam Users' Association, and should they succeed in bringing the measure they propose into operation, they will richly deserve the thanks boiler attendants, boiler owners, and boiler makers. They will deserve the thanks of boiler attendants for saving the lives of some sixty or seventy of their number every year, many of whom are breadwinners, and by thus preventing a vast amount of suffering, not of themselves only but also of their families. They will deserve the thanks of boiler owners and boiler makers for preserving them from a system of Governmental periodical inspection, to which sooner or later they would otherwise inevitably subject themselves, and which could not fail be harassing, and to limit progress. They will also deserve the thanks of the public for the additional security they will have imparted to life and property. We give them our cordial support in the matter, and our best wishes for their success.

## NEW USES FOR PAPER.

NEW branch of industry has just been introduced to our notice. We have for some time been familiar with various novel applications of paper. We have good paper shirt collars and wristbands, paper waist-coats (up to this time of villanous appearance), paper shirt fronts or dickeys (just as ill-looking), and we have seen bonnets, which, however, no female denizen of Whitechapel would think of putting upon her head. But now the uses of paper are very much extended by a patent process of M. Pavy. The paper made by this process is of a peculiar kind. It very much resembles that used by the Japanese for pocket handkerchiefs, and is susceptible of the same application. The patentee calls it "felted," and to a certain extent the term is appropriate. Both animal and vegetable materials are employed in its production. Among the vegetables we find some not hitherto much employed in the manufacture of paper, New Zealand flax, jute, plants of the mallow, and the ordinary fibres, flax, hemp, and cotton. The animal matters used are wool, silk, skins, and another material, which is certainly a novelty in paper-making. These various matters are reduced to pulp and bleached, and then "felted" in appropriate machinery, which is, no doubt, the same as is used in ordinary paper-making. It will easily be understood that the mixture of such materials as

we have named gives a paper of extraordinary pliancy, flexibility, and strength. It can, indeed, be sewn together with as much ease, and makes as strong a seam as the woven fabrics it is intended to replace. The uses to which this paper can be put are innumerable. We may mention a few of the articles we have seen at the office of Messrs. Roberts and Thorne, 82, Gracechurch-street, City. First, petticoats, which no girl of the period could resist. These may be printed exactly like the skirts now so fashionable, or they may be white, and have open work stamped out in patterns, which scarcely any amount of labour with scissors and needle could imitate. The marvel is that they can be sold retail for sixpence each—little more than the cost of washing a petticoat. We have next bed furniture, of imitation cretonnes and chintzes. These are printed with patterns of great beauty, and a set of curtains will only cost five shillings. We have also quilts, which, besides being excellent nonconductors of heat, have a very ornamental appearance. White day covers for beds are made with embossed patterns and equally cheap. White tablecloths, stamped with patterns in remarkably good taste, will, we are sure, soon ornament many a dinner table, and serve to light the fires the day after the party, unless the host be of an economical turn and resells them to the papermaker. But the material is also applied to articles of a more substantial character. Very good imitation leather is formed of it, and furniture covering, and even shoes, may be made. The last can be made impermeable to wet by the introduction of oils and india-rubber. We have said enough to show that a material is produced which will probably have considerable influence on some of our staple industries. Paper collars, it may well be sup posed, have already had a sensible influence on the linen trade, and the further extensive substitution of paper for woven fabrics mus produce still greater changes.

## THE "HERCULES."

IN the Mechanics' Magazine for April 23, a letter appeared A a letter appeared, over the signature of "Detector," in which the writer indulged in a tilt, with full steam on, at the engines of the "Hercules," and their performances. In our present issue, at page 236 appears another letter from the same writer, referring to the same vessel, and upon which we propose to say a few words. As regards the communication itself, we could wish it were written more in the spirit of true scientific discussion and criticism, and less in the captious fault-finding Moreover, we should like to have found some suggestions for improving the points complained against. Any one can vote an R.A. painting a daub, but it is not every one who can produce even a daub himself. However, we let this pass, and take the letter as it stands. Our correspondent "Detector appears to entertain somewhat exaggerated notions respecting the bow wave thrown up by the " Hercules." Not only does he believe it capable of rendering the bow chasers useless notwithstanding the fact that they are about 14ft. above the ship's load water-line-but he gives it credit for maintaining this formidable height in its passage along a length of more than 100ft. of the ship's side, and then swamping the central battery by rushing in at the wing or recessed ports. There can be no doubt, and we do not wish for a moment to deny the fact, that the plough bow, valuable as it is for ramming, does cause a bow wave, and that in steaming against a head sea, at a rapid rate, the main-deck bow chasers of this ship might be, at times, rendered useless. This probability, has, we believe, been foreseen; and the "Hercules'

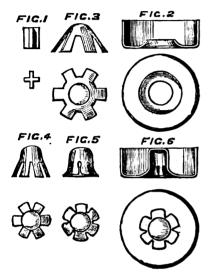
for use in chasing. But while this is true when the circumstances are so bad as we have imagined them to be, it is also true that in comparatively smooth water, even when steaming at full speed, there is no difficulty in fighting the main-deck guns. This statement is supported by reference to the six hours' trial outside the Isle of Wight, when the bow wave never rose within several feet of the bow port sills. In a general action, which is necessarily fought at low speed, or at comparative rest, the bow wave would not

With respect to the coal supply, we also think there is some misapprehension in the mind of our correspondent. It was shown by Mr. Reed, at the meeting of the Institution of Naval Architects, that by means of the increased weight of engines given to the "Hercules," and put into superheaters, surface condensers, &c., her 600 tons of coal will enable her to steam farther than any other ironclad, except the "Warrior," but little less distance than even that ship. There is small probability, we think, of the "Hercules" "being chased by a much swifter ship," since she is the fastest and strongest ironclad yet afloat. As to handiness, also, it is a matter of fact that the "Hercules" has been pronounced to be far superior not only to our other ironclads, but to nearly all war ships, by those who have witnessed her performances at sea. With respect to her cost, we can only go as far as the published returns carry us, and according to the figures there given the "Hercules" is by no means the "most expensive vessel ever constructed"; while we most strongly object to her services being limited, as our correspondent does limit them, "to coast and harbour defence." Her trials at sea prove her to be one of the most, if not the most, efficient sea-going ironclads we possess, both under steam and under canvas. We are at all times desirous of inserting fair and candid criticism upon the ships of the navy, because of the good which we know results from such criticism; but we cannot see what good is to result from imputing to important ships of our own navy—ships which are undoubtedly the best in the world -defects which do not exist. We trust "Detector" and other would-be critics will learn in future to distinguish between mere cavilling and a fair open discussion of facts. True, it is an Englishman's privilege to grumble, but it is only just to those with whose works they find fault that the grumble should have a substantial basis, and not beas in the present instance-directed against shadows.

# MANUFACTURE OF CAPS AND CARTRIDGES.

No. VI.

MOST of our readers are probably acquainted with what are termed "saloon firearms," adapted for indoor practice. They appear to have owed their introduction to the days of duelling, when it was necessary for any well-known "shot" to keep his "hand in" by practising in a large drawing room or saloon, when he had nothing to occupy him in the field. The caps manufactured at the establishment of M. Gevelot, and intended for the cartridge of firearms of this description, are filled in nearly the same manner as that already described for those destined for a more warlike purpose. The cartridges to which we now allude carry simply their priming and a small bullet not much larger than buck shot. Over the cavity of these caps, after the introduction of the priming, and while they are still under manipulation, is placed a small piece of paper. They are is placed a small piece of paper. then submitted to the action of the punch. which presses the paper down upon the powder, while the bullet is subsequently fixed has upper deck guns which could be fought in by the hand. The caps which are intended all weathers, and are more particularly intended for percussion guns are packed in boxes and by the hand. The caps which are intended sold at the rate of sixpence a-piece. Those which are to be attached to cartridges are despatched to the workshops, where the different parts composing the cartridge are severally put together. The cartridge is short and broad. Those used by the infantry are 1.84in. in length, and those manufactured for the carbines of the Chasseurs de Vincennes have a length of 1.56in.; the diameter of both descriptions is 0.68in. The percussion or detonation is effected by a point, which a steel spring draws back directly the blow has been given. In order that the fulminating powder should explode under the shock which is received upon the copper of the cartridge, a small piece of brass, called an "anvil," is placed inside. This anvil, which has four arms at right angles to one another, is represented upon a scale of full size in plan and elevation in fig. 1.



We shall now pass on to the description of the operations by which the various pieces composing the entire cartridge are connected together, so as to render that dangerous little missile complete. The bottom piece, which is of brass, is cut by machinery out of strips of that metal of the thickness required, and each machine can turn out 160,000 of them. force with which this cutting-or, rather, punching—out is effected hardens the metal to such an extent, and renders it so exceedingly brittle, that in that condition it could not be further used. They are, therefore, annealed, and a red heat restores the brass to its original degree of malleability and elasticity. Those of our readers who have visited the Royal Mint are aware that precisely the same thing takes place in the coining of sovereigns. After the little discs of gold have been stamped out of the strip or ribbon of that metal, they are immediately packed together in an iron dish or tray, covered with clay, and subjected to a strong heat in a furnace. This annealing process is absolutely necessary to soften them, in order that they may be enabled to properly receive the impression of the die.

Although this process restores the brass to its normal state, it blackens the surface so much that it has to be cleaned. During this much that it has to be cleaned. During this operation the brass is covered with a thin film of pure copper. This is accomplished by dipping the brass bottoms or end pieces of the cartridge into a bath of sulphuric acid, in which some sulphate of copper has been directly desired. The code are pleased in a backet. dissolved. The ends are placed in a basket of wood or gutta-percha, and in order to stimulate the electro-chemical action, a few small fragments of iron are thrown upon the the basket. After agitating basket for a short time, it is withdrawn, and the "ends" appear glistening with the rosy tint of fresh copper. The basket is washed in water, to remove all traces of the acid, the ends are dried in sawdust, passed through a completely formed. sieve, then placed in an iron barrel rotating upon its axis, for the purpose of being polished, by this little machine.

and finally transferred to another workshop to undergo the next process. This consists in their being pierced through the centre, and a small piece taken out therefrom, which is carefully preserved, as its sale suffices to pay the cost of the piercing. By the same blow, a slight circular depression is made round the hole, and upon the inside the lips of the aperture are turned up, and form a kind of rim, which serves to retain the little chamber that is subsequently placed therein. The "ends" in this stage are represented in fig. 2.

Next comes the fixing of the chamber, which is also accomplished by the blow of a die which forces it into the opening already made in the cartridge end, and beats out the wings of the chamber around the depression formed in the "end." At the same time, a small drill rises up out of a slit in the anvil upon which the striking occurs, and pierces a hole in the bottom of the chamber, thus forming a communication between the interior and exterior of the cartridge end, without which the explosion of the charge could not take place. In figs. 3, 4, and 5 are represented in plan and section the changes that take place in the shape of the chamber during the action of the die and its insertion in the cartridge end. Fig. 6 shows the cartridge end comend. Fig. 6 shows the chamber, and ready pletely furnished with the chamber, and ready the succeeding operation. While the for the succeeding operation. While the preparation of the cartridge ends, as just described, is being carried on in one work-shop, that of the bodies of the cartridge, or cases, are being actively executed in other portions of the premises. The body or case of the war cartridge is different from that of its more peaceful relation, the sporting cartridge. In the latter, it consists simply of paper glued together round a mandril; but in the former it is strengthened by the addition of a coating of brass, so thin that it partakes of the nature of tinsel. The sheet of metal, having been first flattened out, is annealed, to bestow upon it a temper that would permit of its being easily rolled into the cylindrical form required, and all that do not "take kindly" to the operation, are too thick, and rejected accordingly. To obviate the constant occurrence of this delay and inconvenience, the sheets are weighed in the roll as they arrive from the rolling mill. Each piece suffices to make eleven sockets, and should not exceed in weight 238 grains. A margin of fifteen grains is allowed either in excess or deficiency, but any roll that passes those limits is summarily rejected.

The first step consists in laying out upon a slate tablet the piece of paper intended to form the exterior covering of the thin sheet of brass tinsel, and giving it a coating of size. In the meantime, the metal has been bent round upon a mandril, so as to approximate to the required shape, and the two envelopes of metal and paper are then rolled round it together. Before these cases are con-sidered properly finished, they are tested by a gauge of the exact size of the bore of the guns for which the cartridges are intended. f the cases do not fit, it is an indication that they have been badly manipulated, and they are either remade or thrown aside. summer time, these tubes or cases are dried in the sun, and during winter in drying rooms maintained at a temperature of about 105deg. Fah. A practised hand can turn out several thousands of these tubes in a day, and can earn four shillings a day. A very ingenious machine has been invented for the purpose of manufacturing these tubes, by M. Champelle, the manager of the premises situated in the Rue Amelot. The girl engaged in the work first sizes the paper, then places the brass sheet and the paper within the action of a pair of small cylinders, and the case emerges completely formed. As many as 40,000 of the cases can be manufactured in a single day

THE METEOROLOGICAL SOCIETY.

MEETING of the Meteorological So-A ciety was held, on the evening of April 21, at the Institution of Civil Engineers. Mr. James Glaisher, the president, gineers. Mr. James Glaisher, the president, was in the chair, and there was about the usual attendance of members, including Colonel Strange, Drs. Tripe, Brooks, and Mann, Messrs. Doggett, Perigal, Symons, Eaton, Dines, Strachan, Casella, Pastorelli, &c. Dr. Mann read a short paper on earthquakes, in which he repudiated the popular idea that they are connected with meteorological phenomena. Colonel Strange contended that not only was there no evidence of such relation, but that there was no physical phenomena. sical theory to support the notion. Now that attention is directed to the absurdity of the thing, no doubt there will be much less nonsense written about the weather during earthquakes. Mr. Dines read a paper on the fall of rain in reference to the age of the He had worked with two series of observations, one made at Cobham and the other at Chiswick, extending over forty years each. The conclusion at which he arrived was that the fall of rain did not appear to be in any way governed by lunar influence. This paper was followed by a more elaborate one on the same subject, by the President, who had examined fifty-four years' observations made at Greenwich. He found that the tions made at Greenwich. He found that the greatest amount of rain fell on or about the tenth day of the moon's age. The amount is not of such magnitude, it seems to us, as to warrant the conclusion that it is the result of lunar influence. If forty years furnish no evidence, fifty-four years a shaky evidence, probably a longer series would only yield evidence equally doubtful; therefore, the practical conclusion seems to be that lunar influence on rainfall is nil.

In discussion, Colonel Strange and Mr. Doggett both expressed very high opinions upon the merits of these two papers, but were understood to assert that there was no physical reason for imagining that the age of the moon could have anything to do with the production of rain. Colonel Strange also pointed out that rain is often dependent upon local conditions, as at Cherrypongee, in India, where 640 inches of rain have been known to fall in one year; and our own Cumberland Hills furnish another example, for at Seathwaite 180in. is the annual fall. Besides, the wind and the temperature are the immediate active agents in the production of rain; hence, whatever influence the moon might have on rainfall, it ought also to have on the regulation of the winds, the temperature, The results and the atmospheric pressure. of an immense expenditure of time and trouble over these investigations only prove their futility. Henceforth, let them be considered as the vigia of meteorological research.

Mr. Smyth, of Bainbridge, Ireland, read an account of his investigation into the mysterious agent ozone, describing his methods and results. He advocates the use of an aspirator. With his apparatus he has found the ozone in the air at all times a constant quantity. This announcement created much surprise, and Mr. Smyth was, in consequence subjected to a species of cross-examination, but he was quite ready with explanation upon all points. Mr. Glaisher stated that the value of ozone tests was undeniable. the cholera season of 1854, he organized an extensive series of observations on ozone throughout the metropolis. When he came to compare these observations with the returns of mortality for the respective districts, this was the remarkable result:—Where the test papers remained white there were no deaths from cholera; where the papers were browned, cholera was active, and its victims numerous. Mr. Symons urged that Mr. Smyth's investigation ought to be carried on at other places, and verified before his results were adopted by meteorologists. Mr.

Casella, in a fluent speech, dwelt upon the from the retarding medium. This produces value of self-acting apparatus for recording ozone, and upon the importance of uniformity in the methods of observing, or as regards the preparation of the test paper at least.

It is a pity that a larger gathering of persons interested in meteorology cannot be got together, especially when discussions of so instructive a kind as took place at this meeting occur. The annual general meeting will take place on June 16.

## THE ROYAL INSTITUTION.

PROFESSOR R. GRANT, F.R.S., delivered his fourth lecture on "Stellar Astronomy," on Tuesday, April 27, at the Royal Institution. He spoke chiefly of the brilliancy of the light emitted by the stars, and told how an attempt was made by the early astronomers to learn the distances of the stars by measuring the intensity of their light, before astronomical appliances were sufficiently perfect to measure their distances by parallax. The intensity of the light of the planet Saturn, as compared with the light of our sun, was first measured, and then the light of Saturn was compared with the light from the stars. It was then assumed that the stars were nearly equal in size and splendour, and it was found that the sun would have to be removed to 220,000 times its present distance to look like a bright star. The sent distance to look like a bright star. distances of different stars thus computed were afterwards, when measurements by parallax were perfected, found to be, for the most part, too small; hence it was discovered that many of the stars are larger than our sun, and superior to it in brilliancy, whilst

other stars, again, are smaller than the sun.

Professor Tyndall, LL.D., in his fourth
lecture on "Light," delivered on Thursday, April 29, explained why the theory of Newton and other early philosophers, that light consists of small particles emitted with great velocity from the luminous body, had to be abandoned, and he told how the wave theory of Thomas Young and Augustin Fresnel came finally to be adopted. The wave theory assumes the existence of a medium of extreme tenuity and almost infinite elasticity, which fills all space, and bathes the atoms of all material substances. The particles of luminous bodies are believed to be in a state of intense vibration, throwing the surrounding ether into waves, which travel through space, pass through the humours and lenses of the eye, and beat against the retina, in a manner as truly mechanical as the impact of waves upon the sea-shore. The properties of this wonderful ether were minutely described by the lecturer, who said that the reflection of ether waves obeys the law established in the case of light. The angle of incidence is demonstrably equal to the angle of reflection. To account for refraction, for the sake of simplicity, take a portion of a circular wave emitted by the sun or some other distant body. A short portion of such a wave would be straight. Suppose it to impinge from air upon a plate of glass, the wave being in the first instance parallel to the surface of the glass. Such a wave would go through the glass without change of direction. But as the velocity in glass is still less than the velocity in air, the wave would be retarded on passing into the denser medium. But suppose the wave, before impact, to be oblique to the surface of the glass; that end of the wave which first reaches the glass will be first retarded, the other portions being held back in succession. This retardation of one end of the wave causes it to swing round; so that when the wave has fully entered the glass its course is oblique to its first direction. It is refracted. If the glass into which the wave enters be a plate with parallel surfaces, the portion of the wave which reached the upper

a second swinging round of the wave, by which its original direction is restored. simple way, the wave theory accounts for refraction. The convergence or divergence of beams of light by lenses is immediately deduced from the fact that the different points of the ether wave reach the lens, and are retarded by the lens in succession. The density of the ether is greater in liquids and solids than in gases, and greater in gases than in vacuo. A compressing force seems to be exerted on the ether by the molecules of these bodies. Now, if the elasticity of the ether increased in the same proportion as its density, the one would neutralize the other, and we should have no retardation of the velocity of light. The diminished velocity in highly refracting bodies is accounted for by assuming that in such bodies, the elasticity in relation to the density is less than in vacuo. The observed phenomena immediately flow from this assumption. The case is precisely similar to that of sound in a gas or vapour, which does not obey the law of Mariotte. The elasticity of such a gas or vapour, when compressed, increases less rapidly than the density; hence the diminished velocity of the

Professor Tyndall next gave evidence that colour is only a phenomenon of wave-length, there being no difference between red and blue, except that the waves of the former are longer than those of the latter. To show that white light is a compound of many colours, he took a brilliant beam of light from a small round hole in the electric lamp, then passed it through a lens and prism, so that a small impure spectrum fell upon the screen. Between the prism and the screen he then placed another lens, and not only did the spectrum disappear, but a well-defined white luminous image of the carbon points was seen. Then he inserted the thin edge of a small prism a little way into the beam, and thus, by refraction, obtained two images of the carbon points upon the screen, one green and the other red—complementary colours. When the little prism was removed, the colours and images blended, to produce, as before, one brilliant uncoloured image.

On Friday, April 30, Mr. Robert Scott, of the Meteorological Office, gave a lecture at the Royal Institution upon the Meteorological Department of the Board of Trade. exhibited some of the self-recording instruments at work, and gave a history of the changes in the department since the death of Admiral Fitzroy. The system of storm signals now on trial differs from those of former times, in that now no attempt is made to foretel coming storms, but only to inform mariners, by telegraph, of the position and direction of storms at other parts of the direction of storms at other parts of the coast, leaving them to form their own con-clusions. The signalling apparatus to convey this information, now on trial at Blackwall, Liverpool, and North Shields, consists of a tall post, with two arms at the top, worked semaphore fashion, and so arranged as to tell the position, direction, and force of wind of an existing storm. In one respect, the apparatus is not so good as that employed by the late Admiral Fitzroy, because the new signals are not equally visible from all points of the compass. As yet, the records in the Meteorological Office have elicited few new facts about the weather, though it has been ascertained that some storms are exactly repeated after a long interval. The observa-tions tend to confirm Buys Ballot's law:— "Stand with your back to the wind and the barometer will be lower on your left hand than on your right." North-west winds are, however, an exception to this law.

ELECTRICITY AND TELEGRAPHY. HE manufacture of the French Atlantic cable

at the works at Wharf-road, and of the total length of the cable, one section, that from St. Pierre to Boston, has been completed at Mr. W. T. Henley's works, at North Woolwich. The larger section, from Brest to St. Pierre, now making at the Telegraph Construction Company's works at Greenwich, has made such rapid progress that there is no doubt but that it will all be completed to time. The total length of both sections manufactured to last week was about 3,350 miles, and of this length nearly 2,700 miles had been shipped. Three vessels are now receiving cable, the "Great Eastern " (with over 2,100 miles on board of main deep sea cable), the "Scanderia" (with 450 miles of the United States section), and the "William Cary" (with only, as yet, a short length). It is anticipated that the "Great Eastern" will leave Sheerness about the second week in June, but before that time we hope to place before our readers some further interesting details of this truly great enterprise.

Immediately after the completion of the core for the French Atlantic cable, at the Gutta-Percha Works, the conductor for the British Indian line was commenced to be insulated, and before the "Great Eastern" can leave, the machines Greenwich will be in full work manufacturing this cable, which will be a few miles longer than the French Atlantic cable. This cable be in two sections, the one from Suez to Aden, and the other from Aden to Bombay—a total length of 3,600 miles. The two sections differ from each other in the size of core and in external protection, but on the commencement of the work we shall be enabled to give some particulars.

The breaking up of the ice in the Baltic has enabled Mr. Henley to proceed with the work of laying the second and longer section of his Baltic This section, from the island of Bornholme to Liban, in Russia, was interrupted by the formation of the ice last year, and now the vessel engaged has commenced to lay the cable, and in our next its completion may in all probability be announced. At his works at North Woolwich, Mr. Henley is now manufacturing two cables, the one for the Norwegian government, and the other for the new line from Peterhead, in Scotland, to Norway. The conductor in this cable is insulated with Hooper's material.

The South Lowestoft cable was lately broken at sea, and owing to the absence of the company's repairing ship, the interruption was longer than usual; however, owing to there being a second cable between the same points, communication carried on as usual.

A new arrangement of a battery has been intro-duced by M. Guyot. He fills an ordinary porous vessel with finely powdered iron ore; this vessel is placed in an outer vessel containing a concentrated solution of common salt, having a cylinder of gas retort carbon as the second element. are unable to give any information as to its working, but the cheapness of the battery is manifest,

It had been for some time confidently expected that the Government would have brought in their Money Bill, for the purchase of the electric telegraphs of the country, at such an early date in the session as would have allowed the transfer of the telegraph system to the Post Office to have been completed by July 1; at present, the Bill has not been brought in, and it can now hardly be hoped that the Bill can be introduced in sufficient time to allow the transfer to take place at the expected time. The delay in bringing forward the Bill is owing to some of the agreements with the telegraph companies being unsettled. Most of agreements required have been arranged, and the terms of the transfer agreed to; but, in the case of Reuter's Telegram Company and the submarine cable portion of the Electric and International Telegraph Company's property, the settlement is still incomplete. Those agreements that simply related to the various land systems of telegraphs, it was easy, from known information and experience. to arrive at the amounts required for maintenance and renewals; but in the case of submarine cables, the average life and annual maintenance are most uncertain elements, depending much upon their position; experience in this special branch of telegraphy has not extended over a great period, and the experience obtained has been most varied. In order to determine the price for Reuter's Telesurface first, and was first retarded, will also use a reachits under surface first, and escape earliest whole of the gutta-percha core has been finished four-wire scale, from Lowestoft to Nordency, on



the Prussian coast, and the amount to be deducted for maintenance and renewal, an arbitration was appointed; this has been sitting for some time, and, from all appearance, it would seem that their labours are far from a conclusion. The decision that may be come to in this arbitration will be taken as applicable to the Electric Company's cable, and so soon as the arbitration is complete, we shall probably see the Money Bill intro-

duced.

The arbitration commenced its sittings on the 15th of March, since which period it has held nine sittings; it is further adjourned to the 8th, and a further postponement will take place. The evidence accumulated during this arbitration will be of the greatest scientific value on the present question. However, in spite of this delay, it is certain that the Bill will be introduced during the present session. It is anticipated that it will meet with some opposition, but there is little doubt that it will pass both Houses. The Post Office have already given notice of a bill for extending and consolidating the present Telegraph Acts, and also for a bill for preventing opposition to the Post Office when they have acquired the telegraph.

The extension of submarine cable from Cuba to Jamaica, Martinique, and other West India islands, is being again brought forward. General Smith, the President of the International Ocean Telegraph Company, who possess and work the cables from Havana to Florida, is now in England, to endeawour to make arrangements for the necessary extension.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS

NEW EXPLOSIVES WITH PICRATE OF POTASH-COLOURED FIRES-MODE OF PROTEOTING SILVER WARES-A SILVERING SOLUTION.

FONTAINE is not the only Frenchman who M. FONTAINE is not the only and the has proposed to use picrate of potash as a base or principal ingredient in explosive compounds. He seems to have had a fatal monopoly in the use of chlorate of potash, in conjunction with the picrate; but M. Designolle, it appears is an inventor, who proposes to employ the rather less dangerous mixture of nitrate of potash with the picrate. He proposes, indeed, to make four compounds for as many different purposes, -one for small arms, another for mortars, another for cannons of long bore, and a fourth for torpedoes and shells. Give him, he says, the length and diameter of the bore, and the weight of the projectile, and he will prepare a powder which will give to that projectile any initial velocity that may be desired-For the strongest powder to be used for torpedoes shells, and in mines, he uses only two ingredientspicrate of potash with the nitrate. For use in muskets, rides, and other arms, he adds to the above-named ingredients, a proportion of charcoal.

The proportion of pierate of potash is regulated according to the projectile force required. For muskets and small arms, 20 per cent. of the picrate is employed; in a quick burning powder for artillery, fifteen per cent. is used; and for a slow burnarry, inteer per cent. is used; and for a slow burning powder, for the same purpose, only 8 per cent. The powder is prepared much in the same way as ordinary gunpowder. The ingredients are first wetted, and then ground together in a mill to a very fine powder. The mixture is then pressed into a cake, which is granulated and glazed in the usual way. These operations, we should think, can be performed without danger, as the picrate of potash does not ignite under a temperature of 800 Centigrade. The gaseous products resulting from the combustion of picrate of potash are numerous, and, as will be seen in the following equation, which represents the decomposition, half the carbon is left unburnt:

 $C_{12}$  H<sub>2</sub> (3N O<sub>4</sub>) O, K O = 3N + 5 C O<sub>2</sub> + 2H + O + KO, C O<sub>2</sub> + 6 C.

When nitrate or chlorate of potash is employed, this residue of carbon is, of course, burned. above decomposition represents the changes which take place out of the access of air, as in a gun barrel. When burnt in the open air, the combustion of the picrate gives rise to prussic acid and nitric oxide, the latter, of course, instantly oxidising to nitrous acid.

duction of coloured fires.

proportions:-For a golden yellow fire, parts of picrate of ammonia and picrate of iron; for a green fire, forty-eight parts of picrate of ammonia and fifty-two parts of nitrate of baryta; for red fire, fifty-four parts of picrate of ammonia and forty-six parts of nitrate of strontia.

The loss of silver which results from the impreg-

nation of our atmosphere with sulphur compounds, especially where gas is burned, is very great. It has been said that many thousands of pounds worth go down our sewers annually in the form of dirt from plate cleaning, and the loss of one large house on Cornhill from this source has been described to us as serious. Silversmiths may, then, thank one of their confraternity—Herr Strolberger, of Munich—for a happy thought. He seems to have tried various plans to save his silver, if possible. He covered his goods with a clear white varnish, but found that it soon turned yellow in the window, and spoilt the look of his wares. Then he tried water glass (solution of cilicate of potash), but this did not answer. He tried some other solutions, to no purpose; but at last he hit upon the expedient of doing his goods over with a thin coating of collodion, which he finds to answer perfectly. No more loss of silver and no longer incessant labour in keeping it clean. plan he adopts is this:-He first warms the articles to be coated, and then pays them carefully over with a thinnish collodion diluted with alcohol, using a wide soft brush for the purpose. Generally, he says, it is not advisable to do them over more than once. Silver goods, he tells us, protected in this way have been exposed in his window more than a year, and are as bright as ever, while others unprotected have become perfectly black in a few

A non-noisonous silvering solution—non-poisonous, at all events, in comparison with the cyanide solution, which allows no time for the use of antidotes—though not possibly altogether harmless, may be found useful, especially when it can be applied without the use of electricity. The inventor takes one part of nitrate of silver, and dissolves it in twenty parts of water. To this solution he adds half a part of sal-ammoniac, and precipitates the silver as chloride, which he again dissolves by the aid of two parts of hyposulphite of soda. Afterwards he adds to the clear solution two parts of a milk of chalk and water. When used, the mixture is shaken up, a little poured into a saucer, and rubbed over the article to be silvered with a tooth brush or a linen rag. After rubbing a short time, and rinsing with water, the article, it is said, will be found beautifully silvered.

## PARLIAMENTARY NOTES.

IN the House of Commons, on Monday evening, Mr. Stopford asked the Under Secretary of State for Foreign Affairs what sum had been spent for the purpose of keeping in repair British graves in the Crimea since the termination of the war with Russia; who was or had been responsible for the proper application of any money so spent; and if her Majesty's Government had any recent information as to the present state of the cemetery.

Mr. Otway replied that the last information in possession of the Government was contained in a dispatch which had been received from her Majesty's ambassador at St. Petersburgh, who accompanied the Prince and Princess of Wales in their visit the week before last to the graves of those who fell in the Crimes. Some suggestions had been made as to a better preservation of those graves. He regretted to say that he could not satisfactorily answer the first part of the question, because it would be necessary to communicate with various departments with regard to the expenditure and its application. But as the subject had created a deal of interest, not only in that House, many of whose members fell in the campaign in the Crimes, but in many of the homes of the people in this country, he would ask the hon. member to repeat the question in the course of a short time, and he should then perhaps be able to give him some further information on the subject.

At the same sitting, Mr. Baines asked the Post-master-General whether he would accommodate tradesmen and the working classes by reducing M. Designolle also employs picrates for the protection of coloured fires. The following are his under 20s., 2d. from 20s. to 40s., 3d. from 40s. to test of endurance, but sheer waste of ammunition.

60s., or some similar proportion between the amount of remittance and the cost of the order.

The Marquis of Hartington felt sure that it would be a very great convenience to a large portion of the public if the commission now charged could be reduced. The difficulty in the way of such reduction was that, although the money order system might, as a whole, still be remunerative, there could be no doubt that money orders issued at a smaller rate would be issued at a loss; and he thought it doubtful whether the department ought to undertake any such transactions at a positive loss. He would, however, inquire into the subject and see whether any reduction could be made without a considerable sacrifice to the revenue. We do not think that if matters were properly adjusted at the Post Office there would be any loss to the department, whilst, on the other hand, tradesmen and the working classes would be greatly benefited. We do not think the Post Office should be made a source of revenue. Let it be self-supporting, and let the employés receive fair remuneration for their labours, and give the public the benefit of the rest in reduced charges.

# ON THE PROOF OF GUNS.

BY MR. JOSEPH WHITWORTH, C.E., F.R.S., &c.

THE mode of proof I have lately adopted for my guns consists in preventing the shot from moving when the powder is ignited, the gases generated by the explosion escaping only through the touch-hole. About one-sixth of the regular powder charge fired in this way gives the same strain to the gun as a full charge fired in the ordinary manner. To prevent the movement of the shot, a screw is cut on the periphery of the gun at the muzzle, and on it is fitted a screwed cap having a solid end. The gun is loaded with a cartridge of the ordinary length, but containing one-sixth of the regular charge, and supported by tin discs in the centre of the bore: a flat fronted shot, with tight wads to prevent any escape of gas, and a round steel bar reaching from the shot to the end of the bore, are then introduced and the cap with the solid end screwed on. The gun is then ready for firing, after which my measuring instrument is introduced into the bore, and any enlargement to the 10-1000th of an inch in extent may be ascertained. If there be no enlargement, the powder charges may be gradually increased, until a slight enlargement has been produced. The real strength of each gun is thus positively ascertained, and this strength I would have recorded and stamped upon each gun. This would give confidence to the gunners, and would act as a check on those engaged in the manufacture. When the ultimate endurance of any particular kind of gun is thus to be ascertained, the regular powder charges, or any less quantity deemed desirable, be used, the enlargements being recorded after each discharge. A 9-pounder bore gun made of my metal, but reduced 2in. in diameter, has been so tested, and has had 18 full charges of 11/2 lb. fired from it. The expansion in the bore is now 0.1903in., and that of the outside diameter is 0.0485in. The last discharge was witnessed by 0.0485in. The last discharge was witnessed by Captain Osborne and Mr. Fairbairn, on March 30, 1869. As my object is simply to ascertain the power of endurance, I propose to still further reduce the outside diameter, so as to lessen the num-ber of discharges required before rupture is pro-

During these trials some interesting experiments have been made with different metals for the vent. A copper vent was enlarged by one explosion from 1-10th of an inch to 1-4th of an inch. Experiments have also been made on the compression of different metals by the force of the explosion, from which we shall be able to ascer-tain the strength of powder by comparing the results thus obtained with the compression of the same metals by other means. By this method of proving the endurance, the enormous cost at present incurred may be saved, and I would observe that the present method of proving guns for en-durance with a less weight of powder and shot than that which is known to be the most effective, tends to mislead, and is a waste of ammunition. In the "Times," March 16, 1869, an account is given of the "Endurance of the 9-inch Woolwich Gun," according to which 19 tons of powder were consumed in the trial, but, as more than half the rounds fired were with powder charges, only about one-half the most effective charge, and the remain-der with three-quarters the charge, while all the shot fired were only two-thirds the best weight for

# THE HOT AIR FLARE LIME KILN.

BY MR. J. R. SWANN.

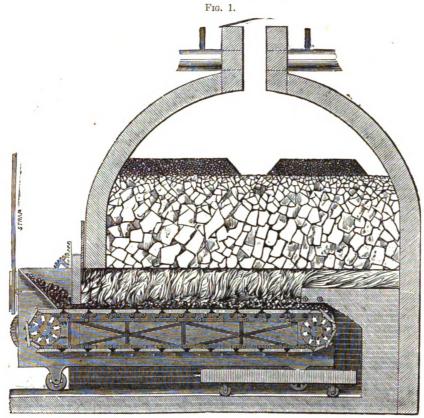


Fig. 2

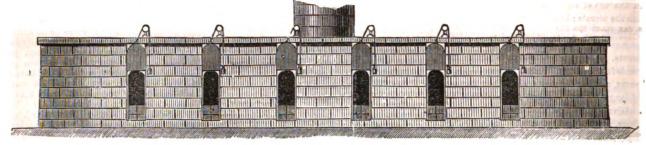


Fig. 3.

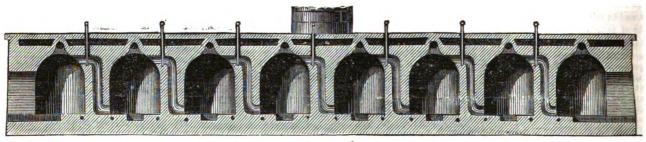
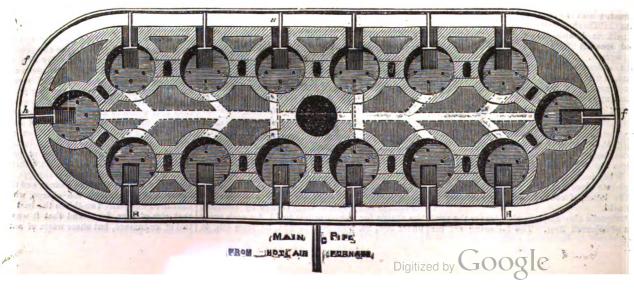


Fig. 4.



WE illustrate herewith a very ingenious lime kiln, invented by Mr. J. R. Swann, of 21, Leith Walk, Edinburgh. It is termed the hot air flare lime kiln, and the principle includes travelling firebars for economy of material and preven-tion of smoke. The kilns are so arranged that the heat passes from the lower to the upper kilns, and by applying heated air, first to drive off the damp, and after to assist combustion, a considerable any ing is effected in fuel and in the time of calcining. It is found, from experiments, that with air heated to 400deg., a 50-yard kiln can be dried in twelve hours without poping, and with half the fuel. Superior lime is prepared by this method, judging by what has been made. By the application of the vapour of petroleum or other liquid fuel vapourized and united with hot air, intensity of heat is generated, giving immense rapidity of production, also effecting a saving in fuel. The firegrate is

SWANN'S HOT AIR FLARE LIME KILNS.

self-supplying, and requires less attention than any other. The fuel is put in a hopper and carried under the door upon an endless chain of short bars (extending the width of the usual firebars), thus forming a travelling grate for the fuel to burn upon. The door is made to slide up and down, and is capable of being set to allow any required thickness of fuel to pass under it; and the chain bars are so arranged as to travel from the door to the back of the kiln, at such a rate as will ensure the fuel being consumed by the time it arrives at back of kiln, and allow the clinkers to down into the ash-pit, or in to a box on

roller in front of the kiln, and another at end of ash-pit, and several smaller ones between. The front roller is arranged to receive motion from machinery, and gives movement to the endless chain bars. The power required is so small that when taken from a steam engine it is quite

wheels, made to run into the ash-pit for that pur-pose. The endless chain bars are carried by one

imperceptible.

The firegrate can at no time, after starting, be covered with bituminous fuel; the supply being gradual from the front end of the kiln, to the back, all the bituminous products are distilled soon after entering the kiln, and pass over coke fire, and thus become completely consumed; consequently, no soot can reach the chalk or issue from the kiln.

The firegrate can never become bare of fuel, neither can air enter the kiln without passing through the fire. The grate can never be clogged up with clinkers to stop free draught, as it discharges the scorize as soon as all the gases are consumed. The labour of firing is reduced to that of putting coal into the hopper, clearing away the clinkers, and occasionally regulating the supply of fuel. The disagreeable work of clinkering, putting coal on the fire, and stirring up, is entirely done away with, excepting at first starting or after long stoppage, and one man can easily attend and fire six kilns. Small coal or screenings are quite as good for these kilns as large coal; this greatly reduces the cost of fuel in price.

In our engraving, fig. 1 shows a section of a flare me kiln. Fig. 2 shows a front elevation of a series of kilns arranged into one general system. Fig. 3 is a longitudinal section of the kilns; and fig. 4 is a plan in section. In this arrangement each kiln has a firegrate A, with firedoors B, and above such doors are other sliding doors C, for filling and discharging kilns; each kiln has a flue D, decending to the floor of the next kiln, and each kiln has another flue E. at the roof leading to the chimney, with dampers to close them when required. The air is heated in like manner to that quired. in which the air is heated for blast furnaces, and is conducted from main pipe G F by branch pipes H, into kilns. Supposing a kiln to be charged with chalk or limestone, the hot blast is turned on and speedily drives the moisture from the stone, which passes to the chimney by the flue E, till it is dried and partially heated. When fires are lighted, the flue E is shut and flue D is opened, as that the heat is driven into the next kiln to sid so that the heat is driven into the next kiln to aid in calcining the limestone in it, the smoke being consumed in its progress.

From experiments already made, superior caustic lime is produced, having a soft tenacious quality, free from core, at a saving of 20 per cent. over the present method. In support of this we append the following certificate from Dr. Macadam, of the Analytical Laboratory, Surgeon's Hall, Edinburgh:—I have made a careful chemical examination of a sample of Sussex chalk, forwarded to me by J. R. Swann, Esq., Edinburgh Saw Mills, and have likewise fully considered the plan of the furnaces which he proposes to employ nace. Several of these ventilators are now at in the burning of the chalk into caustic lime. The work at collieries in different parts of the country,

Sussex chalk possesses the following composition ·--

Carbonate of Lime .		_	_	84.77
Carbonate of Magnesia		•		0.89
Carbonate of Iron .				1.01
Phosphates .				0.13
Silica				1.36
Moisture				11.84

100-00 parts of the Sussex chalk will yield of burned lime 50.17.

From the above analysis, it will be observed that the Sussex chalk is of great purity, and the lime shell of caustic lime obtained therefrom by burning is of first-class quality, and is eminently suited for building purposes and plastering operations.

The mode of burning the chalk into caustic lime proposed by Mr. Swann is ingenious, and is a vast improvement on the ordinary plan of burning. I have satisfied myself by actual experiment, that the employment of heated air in the manner suggested by Mr. Swann for the removal of the moisture from the chalk, and to assist the ordinary coal fire in the after operation of calcining the chalk, and causing the liberation and escape of the carbonic acid, leads to much saving in the actual amount of fuel required to convert the chalk into caustic lime: and I am confident that the plan of calcining proposed by Mr. Swann will turn out first-class caustic lime from the limestone, with a less expenditure of fuel than any of the ordinary methods.

STEVENSON MACADAM, Ph.D.

## INSTITUTION OF MECHANICAL ENGINEERS.

THE general meeting of the members of the above Institution was held on Thursday, April 29, in the Lecture Theatre of the Midland Institute, Birmingham, Sampson Lloyd, Esq., vice-

president, in the chair.

The secretary, Mr. W. P. Marshall, rend the minutes of the previous meeting, and a number of

new members were elected.

The first paper read was a "Description of Guibal's Ventilating Fan Employed at the Homer Hill Colliery, Cradley," by Mr. James S. E. Swindell, of Stourbridge. The fan has eight vanes, and revolves on a horizontal shaft within a cylindrical casing of brickwork, by which it is completely enclosed at the sides and circumference, with the exception of a circular aperture in the centre of one side for the entrance of the air from the mine. and an outlet opening in the circumference for the discharge of the air into the outlet chimney. area of the outlet opening is regulated by an adjustable sliding shutter, according to the extent of ventilation required; and the outlet chimney is built with a gradually Increasing area up to the top, so as to reduce the velocity of the air at the point of discharge, and thereby prevent the loss of power that would occur in discharging it at the velocity of the fan. The fan is driven direct by a horizontal steam engine, working a crank on the end of the fan shaft, without the intervention of The fan at the Homer Hill Colliery any gearing. is  $16\frac{1}{2}$ ft. diameter and  $4\frac{3}{4}$ ft. width, and its usual working speed is twenty-six revolutions per minute. discharging 13,500 cubic feet of air per minute and it can be got up in only about one minute's time to the higher speed of ninety-six revolutions per minute, discharging then 51,700 cubic feet of air per minute. The current of air from the mine passes to the ventilator along an inclined drift leading off from the upcast shaft at a little depth below the top; and the top of the upcast shaft is by a movable cover, which is lifted by the ascending cage on arriving at the top, the weight of the cover being counterbalanced by weights. This is the first mechanical ventilator that has been applied in the working of the South Staffordshire Thick or Ten-Yard coal; and it has now been running about nine months, without a single stoppage for repairs of any description, and is doing excellent work, the total cost of the fan, with engine and connections, being only about one-third of that of an ordinary ventilating furnace for producing the same amount of ventilation. A comparison of actual working between the furnace and the fan at a colliery in the north of England shows that, with a consumption of only two-thirds as much coal, the fan supplies nearly double the amount of air obtained with the ventilating fur-

some of which are as large as 30ft, diameter and 10ft. width, capable of delivering 100,000 cubic feet of air per minute; and they are so free from liability to get out of order that no accidents of any consequence to the ventilation have occurred with any of them.

The next paper was a "Description of the Steam Road Roller Used in Paris," by Mr. E. Gellerat, of Paris, communicated through Mr. George Heaton. This roller consists of a locomotive engine carried entirely upon two large cast-iron rollers of equal size, which are both driven by the engine, the course of the machine being controlled by a special arrangement for changing the direction of the roller axles. The result is that the whole of the weight of the machine is made available both for the rolling of the road and for propelling the machine. The engine is capable of being readily started in either direction without any slipping, and can easily round very sharp curves. machine is the only one which allows all the weight to be made available for adhesion in driving-an indispensable requisite for a really complete rolling machine-none of the weight being dragged; and machines having only one axle driving are liable to slip at starting, causing damage to the road surface to be rolled, and wasting power. Also, the direction of the motion, whether forwards or backwards, being entirely indifferent, is another essential point for rolling roads. By a special mechanical arrangement, the communication of the driving power is maintained direct to both the rollers, however much they may be inclined to each other when traversing a curve; this driving apparatus is made very strong and durable, and it has been found completely successful in work.

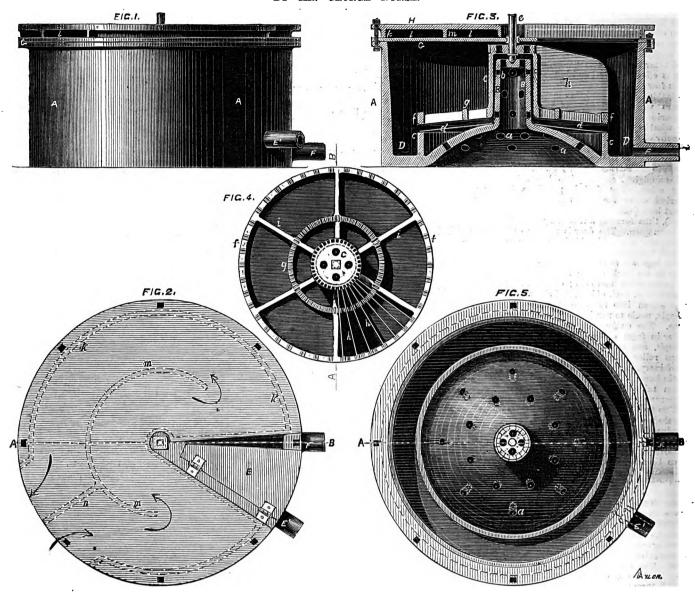
The weight of the machine is equally divided on the two rollers, and the adhesion for driving is so great that these machines have worked up hills with a gradient of 1 in 12½. They are guided with the greatest facility and certainty on the most difficult and winding roads, by the axles of the rollers being made to converge to the centre of the circle which is being traversed. These machines have now been in regular use in Paris for four years, and the results of their working have so thoroughly established their durability and economy that they are used for the whole of the roads in that city and the suburbs. The machine has a longitudinal wrought-iron frame, like a locomotive engine, with cross bearers to carry the boiler, and a water tank at the back of the foot-The two large carrying rollers are 3ft. 10in. in diameter, and 4ft. 7in. in length. They are cast-iron cylinders of 11 in. thickness, with intermediate strengthening ribs and internal flanges at the ends, to which wrought-iron plate covers are fixed. These close the two ends of the rollers, and have cast-iron bosses in their centres for bearings on the axles. The axles are stationary, and the rollers revolve round them with bearings extending the whole length of the roller, and consisting simply of a cast-iron cylinder, with a continuous bearing on the axle, and furnished with a spiral groove for lubrication.

The rollers in the first of these machines were made with separate wrought-iron wheel centres; upon which was riveted a cylinder of boiler plates but this make was abandoned in consequence of the frequent failure of rivets, which were sheared off the stretching of the cylindrical plate from rolling out. The present make of cast-iron rollers, heavier than the original wrought-iron ones, but less expensive in make has proved very satisfactory, and they have done a large amount of work without any expense for repairs, some of them having run as much as 3,000 miles without The first castany sign of cracking or splitting. iron rollers were made quite cylindrical; but it was found that the surface became worn down more at the end next the chain wheel than at the other end; and, to meet this irregular wear, the rollers have since been cast slightly conical, with the larger end towards the chain wheel, so that, when half worn down, they may become truly parallel. One end of each roller has a manhole in it, giving access to the interior for oiling the bearings. There are two sizes of these machines used in Paris—one weighing 15 tons and the other 30 tons in average working order. The smaller one has rollers 3ft. 11in. diameter and 4ft. 7in. in length; the rollers in the larger one being 4ft. 9in. diameter and 6ft. length. machines were adopted for rolling the roads in Paris, in consequence of the satisfactory results of a series of experiments made with them, under the direction of M. Michal, director of the municipal service, by M. Homberg, engineer-in-chief of the public roads of Paris. The machines



# APPARATUS FOR FINISHING TINNED PLATES.

BY MR. GEORGE NURSE.



are hired at a fixed charge, which is regulated by the weight of the machine and the distance run in work; the rate being per ton per mile of the machine, 7d. by day and 8d. by night. This rate includes all expenses of wages, coals, and materials for working and repairs, excepting the supply of water, which is furnished by the municipal authorities. The work of each machine is measured by a self-acting counter, indicating the distance travelled, measured at the mean diameter of wear of the rollers; the measurement of distance being taken only during the actual time of rolling, with an allowance added of three miles for travelling to and from the place of work.

The work is, as a general rule, done in the might within the city, the portion of road repaired during a night being completely finished by the morning, ready for traffic. The speed of working is from 1½ to 2½ miles per hour, being limited to the latter amount by the public regulations. The usual practice in repairs is to lay down a layer of broken stone about 2½ in. thick at the sides of the road, and 6 in. thick in the middle; the surface of the road being generally picked up previously. The rolling engine commences work at the opposite

The work is, as a general rule, done in the night within the city, the portion of road repaired during a night being completely finished by the morning, ready for traffic. The speed of working is from 1½ to 2½ miles per hour, being limited to the latter amount by the public regulations. The usual practice in repairs is to lay down a layer of broken stone about 2½ in. thick at the sides of the road, and 6in. thick in the middle; the surface of the road being generally picked up previously. The rolling engine commences work at the opposite sides of the road; alternately travelling backwards and forwards over a length of about 100 yards, and working its way gradually to the middle of the road, when it proceeds to roll another similar length. The layer of broken stones is watered from the street mains, and binding material, consisting of road scrapings, is put on before the rolling. There is not the slightest difficulty experienced in reversing the motion of the rolling engines, and they start in either direction without any slip whatever, and the broken stone is regularly elled down without getting pushed up or driven before the rollers. The engines start with great

facility, even on a considerable incline, and they turn easily in a circle of only thirteen yards radius. In making new roads, the broken stone is usually laid down in a single layer of 10in. to 12in. in thickness, and this thickness of material can be satisfactorily rolled. The total distance travelled per day of ten working hours by one engine is usually from fifteen to twenty miles. In working, two men are employed for the smaller engines—an engineman and a steersman—and, for the larger engines, a fireman in addition, for the purpose of oiling upon the road without stopping the engine. The mean power developed by the larger engines is about 20-horse power. It is often below that amount, and then sometimes rises to 30 or even 35-horse power. The engines keep well in order, and run 1,200 to 1,800 miles before requiring any important repairs. They are made very strong; the axles, chains, pinions, and working gear being made of steel, and the engin s of the quality of best locomotive work. They are consequently expected to keep at work fully ten years. In reference to the relative cost of rolling roads by the steam roller or by horse power, the following facts may be taken as a comparison of the prices per ton per mile by each plan. The result of numerous data shows the cost of horse rolling in Paris (including horse keep, drivers, and oiling), to be 11d. per ton per mile; or about 11\frac{1}{2}d. including cost of repairs. The addition of interest of capital and depreciation would raise the total cost to about 14d. per ton per mile. On the other hand, for the steam rolling, the actual payment is only half that amount, or 7d. per ton per mile, including the contractor's profit; so that there is great economy as regards cost of power in the steam roller. The advantages of the steam roller over those drawn by horses are economy in the cost of the work,

rapidity of execution, and greater perfection in the work done; the durability of the road surface being found to be at least doubled where the steam rolling has been well done, as compared with roads not so rolled.

The meeting then terminated.

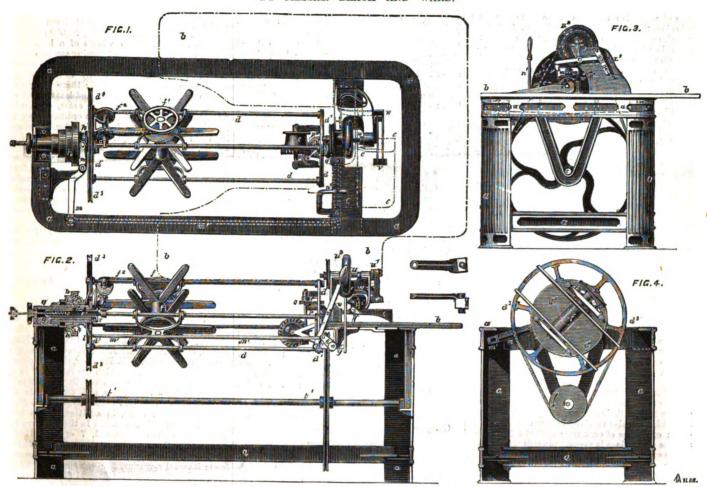
# APPARATUS FOR FINISHING TINNED PLATES.

In the ordinary process of tinning iron plates, the superfluous metal, which adheres to the plates and forms a roughened surface upon them, is removed by the use of what is known in the trade as grease pots. The apparatus we are about to describe is a very great improvement upon this process, which it effectually supersedes. It is the patented invention of Mr. George Nurse, of Pontymister, Monmouth, and consists in constructing the apparatus in the form of a circular pot, with a hollow centre, and with a frame or turntable, which is caused to rotate in the circular hot air chamber. This frame consists of rings formed with studs or projections, to support removable partitions, between which the coated plates are placed, the rings being held by radial arms, carried out from a central support. The cover of the het chamber is provided with a slotted opening through which the coated plates are inserted or withdrawn. The rotation of the frame is produced by a hand-wheel, and as each plate in succession reaches the slot opening it can be taken out and a fresh one inserted. The drippings from the plates fall upon a bonnet, from which they run into an annular space, between the outside of the chamber and a circular flange or fillet, on which the bonnet rests. The drippings may be tapped



#### MACHINERY FOR TWISTING TOBACCO.

BY MESSRS. BLACK AND WARD.



off when necessary by spouts at different heights. Between the cover of the hot chamber and an upper cover flues are formed, through which heat from fires circulates, thereby producing a uniform temperature in the chamber. The brickwork supporting the chamber is situated under the annular space before referred to, so that the metal therein is removed from the direct action of the fires, and, therefore, preserved from oxidation.

Fig. 1 of the accompanying engraving is a side

Fig. 1 of the accompanying engraving is a side elevation of a circular pot, constructed according to Mr. Nurse's invention; and fig. 2 is a plan of the same; fig. 3 is a section of the pot through A B of fig. 2; fig. 4 a plan of the frame; and fig. 5 a similar view of the pot, with the cover removed. A is the circular pot; it is formed with a hollow centre or pillar B, which rises from the bottom. The circular pot A is supported by brickwork or masonry, hollow in the middle, to from a passage for heated air or gases, which is free to enter the pot through the holes ab, provided for that purpose in the base of the pot and in the hollow centre. The inner of the pot has a circular flange or fillet c, for supporting the outer edge of a bonnet d, the inner edge of which fits over the hollow centre, and carries a spindle e, to over the hollow centre, and carries a spindle e, to which is connected a frame, composed of rings f g, formed with rack studs or projections, between which partitions h h are placed, as shown in figs. The rings are connected by radial arms 3 and 4. i to the central support or boss c of the frame. The spindle on which the central frame is fitted has a hand-wheel attached to it, to enable it to be turned in the required direction, when the plates are required to be inserted or with-

The upper part of the circular pot is provided with a cover G which is firmly bolted to the flange or rim. The cover has a slotted opening in it through which the plates are passed; the opening is kept closed while the apparatus is at work by a lid E, as seen in fig. 2. The space D between the inside of the pot and the flange or fillet c forms a channel to receive the liquid metal from the bonthis channel the metal is drawn off by the overflow pipes E 1 and F 1. These are placed at different levels, so that a quantity of fluid metal can be retained in the channel if desired, for the purpose

of keeping up the required degree of heat in the circular pot. Above the cover G is placed another cover H provided with a rim or fillet k of such a depth that a flue or passage l is formed between the two covers. The cover H is provided with a space or aperture corresponding in size to the hinged lid E, so that the opening and closing movements of the lid are not interfered with. under surface of the upper cover H is made with a semicircular rib m, and a radial rib n, as seen in fig. 2, so that the heated air or products of combustion passing through the flue l are caused to take a circuitous route before leaving it.

MACHINERY FOR TWISTING TOBACCO.

N twisting tobacco it is required to enclose A continuous core of tobacco which is slightly twisted in tobacco leaves which are wrapped around the core with a much more rapid twist. article has until lately been produced by hand labour. Improvement, however, which has spread abroad in every other direction, has at length crept in here, and twisted tobacco is now produced by machinery by our leading manufacturers. The annexed engraving represents the tobacco spinning machinery in use at the works of Messrs. Mason and Co., of the Spital Factory, Chesterfield. It is the patented invention of Mr. W. S. Black, of Chesterfield, and Mr. T. Ward, of King's Lynn, who is the sole manufacturer. Fig. 1 shows a plan view; fig. 2 a side view partly in section; fig. 3 an end view; and fig. 4 a transverse section of the machine.  $\alpha$  is the framing; b is a table upon which the tobacco leaves which are to form the core and the outer covering of the twist are laid in heaps. The form of the table b is indicated by dotted lines in the plan view, fig. 1, the table not being shown in full, in order that the form of the framing may be seen clearly; c is a smaller raised table at the points where the core and covering are fed into the machine. The core, as it passes into the machine, lies in the grooves  $c^1$  of the table c; the entrance end of this groove is enlarged, as shown at fig. 2, so that the core, as it is roughly

by means of another workman standing at the side of the machine, these leaves are, by the workman, passed endwise up the incline, and as their forward ends pass under the core which is being revolved, the leaves will be wound up around it. The covering leaves are placed upon the incline  $c^2$  with their ends lapping one over the other so as to form a continuous band, the workman constantly placing fresh covering leaves behind and somewhat overlapping those which are being wound up around the core. d is the frame carrying the capstan e and reel f, upon which the twist is wound up; the frame is composed of two discs  $d^1$  connected together by four rods, as is seen in figs. 1 and 2. The disc at the back end of the machine has a hollow axis  $d^2$  projecting back from it which is capable of revolving freely around the fixed hollow spindle g, which, at its rear end, is carried by the framing of the has rear end, is carried by the framing of the machine. Upon the exterior of the hollow axis  $d^2$  is a driving wheel h formed in steps, upon any one of which a driving belt may be passed; this wheel is capable of revolving freely around the hollow axis, but can be made fast by a coned friction wheel k being forced endwise along the shaft tion wheel k being forced endwise along the shaft by springs l, and so caused to engage with corre-sponding coned surfaces on the interior of the driving wheel. When it is desired to stop the machine, the friction wheel k is moved away from the driving wheel h by means of the clutch lever m (see fig. 1); the end of this lever lies be-tween flanges which pass around the friction wheel, and when the clutch lever is turned to dispurges the friction wheel from the driving disengage the friction wheel from the driving wheel, the two ends of a small projection or enlargement on the under side of the lever near its end are, by the turning of the lever caused to bear against the two flanges, and they put such an amount of friction upon the flanges as at once to stop the axis  $d^2$  and frame d from rotating. The clutch lever is by a rod m 1 connected to a

short arm  $n^2$  on an axis n near the front end of the machine; on this axis is a lever handle  $n^{-1}$  by which the axis can be turned, so that if the workmen fail made up in the hands of the workman, may enter freely into the machine.

The leaves which are to form the covering are fed forward up the inclined side c 2 of the table c; stop the machine by shifting the lever n 1, this

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lever being in close proximity to both of the workmen. The capstan or drum e is carried by bearings from the disc  $d^{-1}$  which is at the front end of the machine, and it is caused to revolve by a worm wheel upon its axis engaging with a worm, on the axis of which is a toothed wheel o gearing with a wheel on the axis of the bevel wheel p. This bevel wheel, as the frame d is revolved, rolls around the fixed bevel wheel q, and is thus caused to turn on its own axis, and so transmits a revolving motion to the capstan. A tubular passage is formed through the centre of this fixed wheel through which the twist is led as it passes from the groove c 1 of the table c. The axis of the reel upon the twist is wound is supported in frames fixed to the rods of the frame d. On the axis of the reel is a grooved pulley  $f^1$  around which passes a cord  $f^2$ , which is also led over guiding pulleys and around s pulley which can turn freely around a tube r which enters into the end of the hollow axis g. The back end of the tube  $r^{-1}$  is closed, and it is pressed backwards by means of the spiral spring s within it. The strength of this spring may be varied by causing the disc t against which the forward end of the spring bears to move towards or from the rear end of the tube  $r^1$ , and so more or less compress the spring; this is done by turning round the screw stem which carries the disc t.

At the forward end of the tube  $r^1$  is a collar which is by the spring s drawn against the side of the pulley  $r^{-1}$ , and thus the pulley is held against the end of the fixed hollow bearing g, and by this means the rotation of the pulley r is retarded, and so the force with which the reel f tends to wind up the twist can be adjusted. At the back end of the frame d is a grooved wheel d 3 which by a cord drives a pulley on the axis  $t^1$ , and this axis by another grooved wheel gives motion by a cord to a pulley on the axis u, upon which is a grank u which gives motion to the malletor beater v which is to strike against the core of tobacco leaves, and consolidate it just at the point where the covering leaves are applied to it. This mallet is carried by arms which at their rear end are jointed to a link. and which are also received between two pieces of cork; one piece of cork rests against a fixed stop, and the other piece is pressed towards the stop by means of the bent spring w.

The crank which gives motion to the hammer is of such a length that when the mallet is by the crank caused to strike a blow upon the twisted core of tebacco the crank will not have passed over the centre of its stroke, and consequently the spring w has to yield to allow the crank to turn, and thus after giving the blow to the twist of tobacco it gives to it a powerful squeeze. The mallet strikes down upon the twist as it lies in the groove c<sup>1</sup>, and thus the twist of tobacco is unable to escape from the squeeze given to it by the mallet, and this squeezing is given to the twist just at the point where the covering leaves are being lapped around it. The covering leaves will thus be caused to bind tightly around the core. In order that the crank u which works the mallet may be carried round at the time of giving the squeeze to the tobacco twist, a small fly us is placed upon its axis, and in order that the action of the mallet may be at once arrested if the machine is stopped a small wooden brake block w is at this time caused to be forced against the periphery of the fly wheel. The block x is for this purpose carried at one end on a pin  $x^1$ , and at its other end it is connected by a rod to a small arm y on the axis of the disengaging lever; z is a roller which is carried by an arm on the pin z, and this pin is turned by a spring z<sup>2</sup> in such manner as to press the roller against the twist of tobacco and so keep it in the groove c 1,

This machine is used for spinning tobacco into the forms known as "Irish Roll," "Limerick Twist," &c., which has hitherto been spun by hand alone. The machine at Messrs Mason's factory alone. will spin all that can be supplied to it; the quantity produced, therefore, depends entirely upon the dexterity of the feeder. At Spital Factory some of the girls can spin from 500lb. to 800lb. per day, whilst the average quantity spun by hand is, we believe, about 60lb. or 70lb. per man per day. The cost of producing the roll by machine is not more than one-sixth that of hand labour; at the same time, a firmer roll is made. Each machine requires four or five girls to supply the material, and their combined wages amount to less than is usually paid for one man's work.

THE subway from the Tower to Southwark is now advancing at the rate of 9ft. per day, and the con-tractor expects to reach the shaft on the Southwark side in less than five months.

### UNIVERSITY OF GLASGOW.

THE following is the prize list of the class of civil engineering and mechanics of the University of Glasgow, session 1868-9:—Walker prizes. For an oral examination—First, Robert M'Haffle Melliss, jun., C.E., Glasgow; second, Alexander Malcolm, C.E., Balfron. For a written examination—First, Alexander Malcolm, C.E.; second, Robert M'Haffle Melliss, jun., C.E. Class prizes:—For oral examinations—Division A, Alexander Malcolm, C.E.; division B, Richard Niven, Glasgow; division C, James Young, Balloch. For written exercises—Division A. R. M'Haffe Melliss written exercises—Division A, R. M'Haffe Melliss, C.E.; division B, W. Overland Dungar, Gaywood, King's Lynn; division C, Robert W. Maxwell Müller, Glenyards, Denny. (Signed.) W. J. Macquorn Rankine, C.E., LL.D., Professor.

The following have received tickets of proficiency.

in engineering science:—Anthony S. Bower, C.E., St. Neots, Hunts; Waltor Deed, C.E., Colchester; James J. Galloway, C.E., Paisley; James Gillespie, jun., C.E., Garnkirk; Alexander Malcolm, C.E., Balfron; Robert M'Haffie Melliss, jun., C.E., Glasson, M. M. M. G. K. G. G. K. G. gow; George D. Neill, C.E., Greenock; John

Russoll, C.E., Glasgow.

The following are the names of the candidates who have passed part of the course of study and examination in engineering science:—Mathema tics, natural philosophy, geology, civil engineering and mechanics, drawing—James Simpson, Glasgow; mathematics, natural philosophy, chemistry, geology—Archibald B. Allen, Crosshill; Richard Niven, Glasgow; mathematics, natural philosophy, chemistry—Henry Dyer, Glasgow; Robert Napier Glasgow; mathematics, natural philosophy, geo-logy—Robert Stephenson, Inkerman, Paisley; mathematics, natural philosophy—John Wood;
W. Overland Dungar, King's Lynn; geology,
civil engineering and mechanics—Thomas Alexander, Glasgow; geology, A. Cook; William Grant,
Rothsay; R. W. M. Müller, Denny; W. T. Olive.
For the Board of Examiners in

Engineering Science W. J. MACQUORN RANKINE. (Signed) W. J. MACQ Glasgow University, April 28.

EXPERIMENTS WITH PERCUSSION CAPS

OBJECTIONS have of late been raised by the Various great carrying companies to the conveyance of percussion caps, and penalties have occasionally been enforced against senders of these articles. This has led to the interference of the Birmingham Chamber of Commerce in the matter, with the view of testing the explosive or nonexplosive nature of caps when struck in bulk. Accordingly, yesterday week a series of experiments were carried out, at the Ammunition Works of Messrs. E. and A. Ludlow, of Belmont-row. Birmingham. The Government, the leading railway companies, and various underwriting associations, &c., were represented on the occasion. In the first experiment, a tin box containing 250 caps was placed in an ordinary fire, where it remained until all the charges in the caps were burnt out. All the caps gradually burnt, without the lids of the boxes even being blown off, although the lids were well nigh melted. The second experiment consisted in placing half a hundredweight of caps in a red hot muffle; the result was a kind of fizzing at intervals, but there was no explosion. In the third experiment, 50,000 caps were put into a packing case in the ordinary way for transit; these were placed in a furnace; the wood burnt gradually away, but not the slightest explosion occurred; the caps remained stacked in pyramidal form exactly as they had been fixed. A fourth experiment was that of placing within an iron pot, 10in. in diameter, and 10in. deep, a lump of red hot iron, weighing 2lb.; on this 20,000 loose caps were poured, and the pot was filled up with cotton wool; gradually the caps exploded, and the cotton wool became charred, but no flame whatever arose. A lucifer match was put to the wool, which ignited instantly. In the fifth and sixth experiments, brown paper parcels containing 5,000 caps were struck by a mass of iron weighing one hundredweight, and falling from a height of 12ft.; in one of these the box was surrounded by cotton wool, but no explosion occurred. Gunpowder was then substituted for the cotton wool, and, as might have been expected, an explosion occurred; but the mere dropping of the weight on gunpowder alone did not cause an explosion. In the seventh test a parcel containing 5,000 caps

were crushed, but again there was no explosion. Another experiment was that of placing 410 cart-ridges for the Remington rifle in a box; gunpowder was placed within the box, and a fuze applied to one of the cartridges; it alone exploded, the others in the box remained perfect. The party then adjourned to the London and North-Western Railway, where a bag, containing 20,000 caps, was placed on a rail. Two wheels of a locomotive passed over the bag without causing any explosion; at the passage of the third wheel there was a small explosion, but that occurred only to the few caps which were absolutely crushed; there was no explosion in bulk. In the ninth and last special experiment, two wooden packing cases, containing 50,000 caps each, put up in the ordinary way for transit, were submitted for concussion by attaching them to the buffer (not a spring buffer) of an engine. In this test there were employed an engine and three trucks with two brake vans and three trucks; the engine and tender weighed forty When the boxes were struck the engine was travelling at the rate of twelve miles an hour; the boxes were, of course, crushed, and the pieces flew all about, but it was in isolated instances only that the caps exploded. The results of these experiments ought to satisfy the most sceptical that percussion caps are non-explosive in bulk, and are, therefore, practically safe in transit.

### MANCHESTER STEAM USERS' ASSOCIA-TION.

THE last ordinary monthly meeting of the executive committee of this Association was held at the offices, 41, Corporation-street, Manchester, on Tuesday, April 27, 1869, Mr. Hugh Mason, of Ashton-under-Lyne, Vice-President, in the chair, when Mr. L. E. Fletcher, chief engineer, presented his report, of which the following is an abstract:—During the past month 221 visits of inspection have been made, and 489 boilers examined, 279 externally, 7 internally, 6 in the flues, and 197 entirely, while, in addition, 1 has been tested by hydraulic pressure. In these boilers 143 defects have been discovered, 7 of them being dangerous. Furnaces out of shape, 10; fractures, 30 (2 dangerous); blistered plates, 11 (1 dangerous); internal corrosion, 22; external ditto, 22 (3 dangerous); internal grooving, 21 (1 dangerous); external ditto, 4; water gauges out of order, 7; blow-out apparatus ditto, 6; fusible plugs ditto, 2; pressure gauges ditto, 4; boilers without pressure gauges, 1; without feed back pressure

During the stoppage of the mills at Easter advantage was taken of the opportunity for making as many internal and flue examinations as possible of the boilers enrolled, the engineering staff engaged in the office turning out to assist the inspectors in getting inside the boilers and up the flues. In this way a large number of entire examinations were made. The defects met with were not generally of a novel character, so that only one of them merits remark on the present occa-This was a case of fracture, which occurred to a blow-out elbow pipe, from its being tightly bound in the brickwork setting, when the movement of the boiler, consequent either on its settlement or the expansion of the parts, broke it in This occurred when the boiler was in work, and, fortunately, was shortly discovered by the difficulty experienced in keeping up the water level. The objection to binding blow-out albow pipes in the brickwork has been frequently alluded to on previous occasions. The cross wall should be recessed so that the elbow pipe may be quite free, and thus unaffected by the movement of the boiler, be less exposed to corrosion, and at the same time open to view. This arrangement should be attended to in laying down all new boilers, while there is very little difficulty in introducing it in those already set.

Mr. Fletcher reports three explosions, by which five persons were killed and six others injured. The scene of the catastrophe has been visited in two cases by officers of this Association. In the other case, full particulars have not yet been received. Not one of the explosions occurred to boilers under the inspection of this Association. The following is a statement of explosions, from March 27, 1869, to April 23, 1869, inclusive:— April 1, portable agricultural boiler, locomotive type (internally fired), 1 killed, 4 injured; April 19, portable vertical boiler (internally fired), 4 killed, 2 injured-total, 5 killed, 6 injured.

was placed in a box with a quantity of cotton wool.

An explosion occurred at two o'clock on the This was struck by a block of iron weighing afternoon of Thursday, April 1, to the boiler of a 15cwt., falling from a height of 4ft; the caps portable agricultural steam engine, engaged in



# PORTABLE PRINTING PRESS. BY MR. H. HEYER.

thrashing out a rick of barley at a farm yard, and resulted in the death of one person, as well as in injury to four others. The boiler, which was of the multitubular locomotive type, measured 8ft. 6in. in length and 2ft. 4in. in diameter in the Sft. 6in. in length and 2ft. 4in. in diameter in the barrel, or cylindrical portion of the shell, while the thickness of the plates was 5-17ths of an inch, and the load on the safety valve 50lb. The boiler gave way in the outer shell, which was completely destroyed, being rent from the inner casing of the firebox, torn up into a number of small pieces, and scattered in every direction, one to a distance of 90 yards, another to 100 yards, while the smokebox door was thrown to a distance of 150 yards. On the occurrence of the explosion, the son of the proprietor, who was close to the engine at the time, was killed on the spot, while another man standing by him is reported to have been blown up into the air as high as one of the adjoining stacks, while three others were scalded. The simple cause of the explosion was the mal-

The simple cause of the explosion was the mal-construction of the boiler. The manhole was not strengthened, as it should have been, with a substrengthened, as it should have been, with a substantial cast-iron mouthpiece, through the neglect of which so many explosions have from time to time occurred. From this unguarded manhole, which was placed at the crown of the outer easing of the firebox, the primary rent sprung, which, developing in various directions, ripped the shell into fragments. The cover of this manhole was of the dangerous internal class, being carried by a couple of bridges, from each of which two bolts were suspended. An attempt had been made to strengthen the manhole by an external wroughtion ring, half an inch in thickness and one inch in width, but this was attached to the shell by iron ring, half an inch in thickness and one inch in width, but this was attached to the shell by four five-eighths rivots only, while the heads inside the boiler were nearly gone. In consequence of leakage from this joint, the plate, originally 5-16ths of an inch in thickness, was so eaten away that only 1-16th of an inch remained. Had this manhole been strengthened by a suitable cast-iron mouthpiece, the leakage at the cover would not have been eaten away by corrosion, while at the same been eaten away by corrosion, while at the same time the parts would have been strengthened and the explosion prevented.

# THE HOOSAC TUNNEL.

THE Governor of the State of Massachusetts has sent the report of the Commissioners on the and Greenfield Railway and Hoosac Tunnel to the House of Representatives. It is stated in the report that up to February 1 last, the east end heading had been pushed 5,282ft., the east end enlargement 2,500ft., the west shaft heading 4,056ft. and the brick arch finished to a length of The total length to which the headings had been carried at that time was 9,338ft., leaving to be completed 15,693ft. The depth of the ce ntral shaft when finished will be 1,030ft. This shaft has been sunk 583ft., leaving 447ft. to be completed. According to the report of the State

to be completed 15,693ft. The depth of the central shaft when finished will be 1,030ft. This shaft has been sunk 583ft, leaving 447ft. to be completed. According to the report of the State Auditor, the cost of these works, so far, amounts to nearly ten millions of dollars.

HOW ERONZE STATUES ARE CAST.

A MONG the various branches of fine art metal work, the casting of bronze statuary, a chefdourne of Messrs. Elkington's world-famed establishment possess perhaps as many points of interest as any. A leading process of bronze casting is known, says the "Engineer," as the cire perdue, or wax process. A structure of iron bars forming the skeleton of the statue sustains the core. This rough angular outline stands on a kind of platform, having a fire-hole beneath for the purpose of melting the wax when the statue is completed. A mixture of clay, pounded brick, and other material capable of being casily worked when moist, and very solid when dry, is then used for building up the skeleton, so as to present the general contour of the figure, but less than the proposed statue by just the thickness of the metal to be employed. Over all this is placed an equal layer of wax, on which all the details are expressed by the sculptor. "When," says Mr. Altkin, our informant, "the work is satisfactory from every point of view, ascending rods of wax representing channels by which air is to find exit on the metal entering the moulds are placed wherever required. Viewed in this state, the model of the body, which is reached, are external to the model of the body, which is reached, are external to the model of the body, which is not find exit on the metal entering meshwork. The whole model and rods are then painted, over with fine loam in a liquid state, the process being repeated until the crust is strong enough to sustain a thick



loam plaster. It is then bound with iron hoops, and a fire is lighted beneath the platform. The outer coating of wax, exactly representing the metal to be east, is melted out, and the mould is intensely heated until dry enough to receive the molten metal from a reverberatory furnace adjacent to the mould. Jets are made for the introduction of the metal, and the apertures left by the melting of the wax rods afford a ready mode of exit for the air. The plug of the furnace is withdrawn, the flowing metal fills the mould, and the statue is completed. This process is somewhat hazardous, seeing that any defect in the casting would completely destroy the long labour of the artis.

# PORTABLE PRINTING PRESS.

A VERY ingenious and useful article has just been brought under our notice by Mr. H. Heyer, of 101, Leather-lane, Holborn. It is a portable printing press, and is shown in the annexed engraving. It consists of a frame, having a carriage, in which the type is placed. When so placed, with the paper for printing, the tympan is folded down, the carriage pushed in, and the pressure brought upon it by means of the handle, the lower part of which is cam-shaped. A printing "office" accompanies the press; it comprises type, ink, slab, roller, &c., ready for use. These presses are made of various dimensions, and will print from a trade card to quarto size. Common type and ordinary printing ink are used, and the VERY ingenious and useful article has just presses are made of various dimensions, and whin print from a trade card to quarto size. Common type and ordinary printing ink are used, and the apparatus is exceedingly handy and simple. It will be found useful by all who have cards or circulars to print—especially if they require them in a hurry.

### LONDON ASSOCIATION OF FOREMEN ENGINEERS.

usually furnished with four or five. These were supposed to be watertight. Too frequently it was found, in the fell moment of peril, that they were nothing of the kind, and that after a collision it might be said of the vessel that she contained "water, water everywhere," whilst the pumps were incapable of discharging it. Bulkheads were, in ninety-nine cases out of the hundred, illusory and deceptive protectors of iron ships. Vessels of this kind, as now constructed, were calculated well enough for ordinary service under favourable circumstances, but were totally unfitted to contend against the extraordinary accidents which often befel them at sea. It was quite true that the past twelve years had witnessed great improvements in the construction of iron vessels, both as regarded the quality of the material used and in its mode of application. The author of the paper introduced at this point some startling facts which had come under his own notice when engaged as manager for a large shipbuilding company, and which demonstrated very forcibly the haphazard modes of construction commonly practised not many years since. Mr. Rae also took some credit to himself for remedying the evils to which he referred, and especially considered himself entitled to commendation for having been the first to introduce the plate-planing machine into the shipbuilding yard. This apparatus was now almost universally employed instead of, or as supplementary to, the shearing machine, and Lloyd's rules distinctly specify that all "butts" shall be planed. The economy and excellence of iron ship building had been enhanced in a remarkable degree by the use of the planing machine.

The author next addressed himself to the question of internal defects in the construction of iron ships, and pointed out more particularly the weakness which was formerly observable in regard to the head and stern. In 1858 he decided to commence an improved system of connecting the stem and stern to a considerable height, and the solidity of the vessel was thus incre

the Government.

Mr. Rae then proceeded to say that all iron vessels ought to be built with an internal as well as an external iron skin, the latter, of course, being of the greater thickness. Both should be made perfectly watertight. Between the inner and the outer skins a series of bulkheads (say 9ft. apart), and extending from gunwale to gunwale, should be affixed. The spaces between the bulkheads should be filled in with asphalte, so as to prevent water passing from one space to another.

with asphalte, so as to prevent water passing from one space to another.

Such an arrangement would add but little to the original cost of the ship, whilst it would increase her strength fully 50 per cent. A ship was, indeed, "a thing of beauty," as well as a valuable minister to the wants of mankind, and it was the duty of an enlightened country like ours to frame stringent laws for governing its constitution, and thus to promote the safety of those who entrusted their lives to the ocean.

the ocean.

Mr. E. J. Reed, Chief Constructor of the Navy, commenced the discussion which followed the paper, and in doing so said that he agreed with its author as to the generally faulty construction of iron ships as built some few years since. Even now he thought that legislation might be beneficially employed in regard to the construction of iron ships for commercial purposes. He considered that the Admiralty had not acted unfairly towards the reader of the paper. That gentleman had, no doubt, discovered the weak points to which he had referred in

regard to the stems and sterns of the older iron

regard to the stems and sterns of the older iron ships, but so had many others, and it was hardly to be expected that so self evident an improvement could come under the prohibitory provisions of letters patent. For himself (Mr. Reed) he had a dislike of patents generally.

As to the double skinned vessels with "asphalte" filling between the bulkheads, he had little faith in it. The ship in such case would be permanently loaded very much to her detriment, whilst the contingent advantage was problematical. He wished also to say that in every instance where bulkheads were used in the Royal Navy, their watertight qualities were tested by hydraulic pressure.

Mr. Wearing combated some of the propositions of Mr. Reed, and considered that the Government was rather apt to appropriate the inventions of those who submitted them for consideration. The patent system was, on the whole, good, but it required some modifications.

modifications.

Mr. Vinnicombe defended the Government from

Mr. Vinnicombe defended the Government from the charges made against it.

Mr. Campbell followed in the same direction, and cited cases where compensation had been awarded for valuable communications.

Messrs. Stabler, Taylor, Clark, Ives, Walker, the chairman, and others, continued the discussion, and, finally, a vote of thanks was unanimously awarded to Mr. Rae, who, in returning thanks, took occasion to reply to some of the objections of Mr. Reed and others who had differed with his (Mr. Rae's) propositions. At a late hour the sitting terminated.

### APPEARANCE OF A COMET.

TELESCOPIC comet is at present visible, and A TELESCOPIO comet is at present visible, and is likely to remain so for an unusual length of time. It was discovered near the beginning of last month by Dr. Winnecke, at Karlsruhe, and has been identified with Pons's comet of 1819 and Winnecke's of 1858—a small comet with a period of only five and a half years. It is expected to come to its perihelion about June 30, and to be again seen afterwards, though chiefly in the southern hemisphere, until September. In the great length of period of its visibility and the short elliptical character of its orbit, it is therefore something approaching the wards, though chiefly in the southern hemisphere, until September. In the great length of period of its visibility and the short elliptical character of its orbit, it is, therefore, something approaching the planetary, though as to its physical structure it is cometic in the extreme, for all that a six-inch object glass would show on Friday night—the finest observing night, too, for months, and with the comet at so large an altitude—was a faint speck of vapour (barely visible under a low power and vanishing under a high one), about three or four minutes in diameter, and slightly concentrated towards a nearly central nucloid point. Its position in the sky on last Friday night, at half-past ten o'clock, says a writer in the "Scotsman," was in right ascension 9 hours and 58 minutes, and in declination 36 degrees and 39 minutes, so that it is high up to the south and a little to the west of the meridian when twilight ceases; and its motion is very slow just at present, with a right ascension decreasing and declination increasing slightly, but about to stop and then change to decreasing. As the comet during the next two months comes every day nearer its perihelion, and becomes illuminated by a stronger and stronger solar sight—the sun each day subtending in its sky a large angle—it will be visible in smaller telescopes wherever a dark night can be commanded; but that will not be in Edinburgh or northward thereof, where for several weeks on either side of June 21 there is no true darkness, but a gloaming instead, which will probably outshine the comet, even at its brightest and best. We cannot, therefore, hold out to the public any promise of a brilliant display to the physical eye, though the mental vision may wonder admiringly at a barely visible and formless patch of thin mist, knowing its proper path of several hundreds of millions of miles in circuit round the sun, and describing every part of that path with such them with theoretic perfection, while on the other it enables all the chief events of its past histo

## A WEEK'S WORK IN BIRMINGHAM.

A WEEK'S WORK IN BIRMINGHAM.

A WEEK'S work in Birmingham in its aggregate results is something wonderful. According to the "Engineer," it comprises the fabrication of 14,000,000 of pens, 6,000 bedsteads, 7,000 guns, 800,000,000 copper or bronze coins, 20,000 pairs of spectacles, 6 tons of papier maché ware, £30,000 of jewellery, 4,000 miles of iron and steel wire, 10 tons of pins, 5 tons of hair pins, hooks and eyes, and eyelets, 180,000 gross of wood screws, 500 tons of nuts, screw bolts, spikes, and rivets, 50 cons of wrought-iron hinges, 350 miles length of wax or vestas, 40 tons of refined metal, 40 tons of lerman silver, 1,000 dozens of fenders, 8,500 fellows, 1,000 roasting jacks, 150 sewing machines, of the Institute, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and silver, who subscribe £ each is 100 tons of brass and copper wares, besides and copper wares.

almost endless multitude of miscellaneous articles, of which no statistics can be given, but which, like those enumerated, find employment for hundreds and thousands of busy hands, and are destined to supply the manifold wants of humanity from China to Peru.

# Correspondence.

THE MYSTERIES OF "HERCULES."

TO THE EDITOR OF THE "MECHANICS' MAGAZINE." SIR,—I believe the ship "Hercules" to be as good a specimen of hand-craft as any vessel afloat; why, as Mr. Holland says, should she not be called a "spade?" A plough were more appropriate. In her rapid passage through the water she turns over a beautiful wave furrow, the sea runs up the incline how they chestra era rendered useless and her a beautiful wave furrow, the sea runs up the incline bow, her bow chasers are rendered useless, and her wing guns nearly so. When would I fight such a craft? In a stiff breeze, with a breaking sea. If she attempted to give battle with her wing guns, those huge fillers cut out of the sides of the otherwise good ship, asthings go, would drown the men out of the central battery. It is all very well to hear that she behaves like a duck in calm weather. Has she ever been haves like a duck in calm weather. Has she ever been in a gale of wind across the Atlantic? And what is the use of a ship of war that cannot fight in a stiff breeze. We seek shelter when such occurs in an ocean battle. We hear that she is as good a vessel as any our friends have. One of the advantages claimed is her cheapness; she is the most expensive vessel ever constructed for coast and harbour defence. As regards an ocean cruiser she is nowhere. The nominal power in her is great—double than The nominal power in her is great—double than what has appeared in print. If six times the nominal what has appeared in print. If six times the nominal measures were developed, how long would the coals last? Could she steam forty hours chased by a much swifter ship. She could barely do so with 600 tons of coal, steaming 8,258 tons horse power. It is argued that to increase her length would increase the armour. Well, I think that is quite clear; but to give her seven beams in length would likewise increase the coal stowage. Then it has been stated that the ship would be bigger, and we would require more men to keep her clean. I think the cleanness of the ship is of little account in the din of battle. What with fire engines and what-not, little need be said about such paltry technical arguments in time of peace. Next, she is termed a handy vessel. Very, I should not think, in the middle of in time of peace. Next, she is termed a nanay vessel. Very, I should not think, in the middle of Atlantic.

This brings me to ask, What is war? I take it to be destroying our commerce, seizing all our merchant ships on the broad ocean. Could the "Hercules" prevent this? She may take a day's cruize from our shores, but we must remember coals are not to be had at sea. I sthe mystery unravelled. I think partly; and it is this, that when shipbuilders provide ships for the mercantile marine they give sufficient coal stowage to suit the requirements.—I am, Sir, yours, &c.,

DETECTOR.

[Our Correspondent will find his "mysteries" unravelled at page 326, where we have discussed the above somewhat spasmodic communication.—ED. M. M.]

# VELOCIPEDE INSTITUTE.

VELOCIPEDE INSTITUTE.

SIR,—I beg to forward you a copy of a letter I have addressed to the President of the Board of Trade, thinking that the formation of the Imperial Velocipede Institute may be interesting to many of your readers, from whom I shall be very glad to receive suggestions.

I trust you will lend to such society, having a useful object in view, your valuable assistance.—I am, Sir, yours, &c., Alf. D. DE LAVIGERIE.

6, St. Swithin's-lane, E.C., May 5.

6, St. Swithin's-lane, May, 1869.

SIR,—Some friends and myself, having considered the general usefulness of velocipedes, and especially the use which the French Government is now makthe use which the French Government is now making of them, by supplying with one of them every telegraphic messenger, and most of the country postmen, it is our intention to form, at once, in England, a society having the following objects:—

1st. To give prizes for the best velocipedes or carriages for public roads having any motive power excent horses.

per annum, and, thirdly, ordinary memers sub scribing  $\pounds$  per annum each. No profits in money is to be divided among the

members, but a secretary, manager, solicitor, and teachers, may be employed with salaries. The society to be conducted by a committee of not less than three and not exceeding fifteen members.

It is also intended to publish either books, pamph-

It is also intended to publish either books, pamph-lets, or a newspaper, to advocate the objects of the society, or to make arrangements with a publication already established. And I have now to ask you to be good enough to inform me whether, in the event of such a society being properly framed under the Companies Acts, 1862 and 1867, and not being one formed for profit, you will authorize it, and give it the privileges of the 23rd section of the last-named Act of Parliament.

I have the honour to be, Sir, Your most obedient servant, ALF. D. DE LAVIGERIE.

The Right Honourable John Bright,
President of the Board of Trade.

[It is true that M. Drouze succeeded in inducing the French Government to mount a certain number of rural postmen upon velocipedes, but an accumulation of ice and snow put a stop to the enterprise, which had not sufficient vitality to revive.—
ED. M. M.]

### TO CORRESPONDENTS.

THE MECHANIOS' MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in advance.

of £1 ls. 8d, yearly, or 10s. 10d. half-yearly payable in advance.

All literary communications should be addressed to the Editor of the MECHANIOS MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANIOS MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. ED, M. M.

Advertisements are inserted in the MECHANIOS MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

REGEIVED.—E. E.—W. J. M. B.—G. E. P.—S. A.—H. G.—D. T.—H. S.—O. and P.—G. W. H.—T. E.—N. G. T.—S. K. M.—P. R.—O. E.—B. B.—G. M.—R. L.—J. N.—E. and A. L.—N. R.—K. and CO.—B. F.—H. C. H.—J. B.—A. R.—R. F.—A. B.—R. L.—B. and P.—E. C.—G. W. H.—H. J. R.—G. E. P.—B. H.—R. T.—J. F.—O. E.—G. R. P.—R. H. S.—J. R.—W. S. B.—H. S.

# Meetings for the Week.

MON.—Royal United Service Institution.—Colonel A. Cunningham Robertson, Commanding 2nd Batta.

8th or King's Regiment, on "The Constitution of our Military Forces, and Conditions of Military Service," at 8.30 p.m.

TUES.—Royal Institution.—Professor Grant on "Stellar Astronomy," at 3 p.m.

The Institution of Civil Engineers. — Mr. John Ellacott, M. Inst. C.E., on "Description of the Low Water Basin at Birkenhead," at 8 p.m.

WED.—Civil and Mechanical Engineers' Society.—Mr. George W. Usill, Member of Council, on "The Water Supply to Towns and Villages," at 8 p.m.

Water Supply to Towns and Villey, 8 p.m.
THURS.—Royal Institution.—Professor Tyndall on "Light," at 3 p.m.
FRI.—Royal Institution.—Mr. Perkin on "The Newest Artificial Colouring Matters," at 8 p.m.
Royal United Service Institution.—Captain V. D.
Majendie, R.A., Assistant Superintendent,
Royal Laboratory, Woolwich, on "The MartiniHenry Rifie," at 3 p.m.
SAT.—Royal Institution.—Professor Seeley on "Roman
History," at 3 p.m.

# Nabal, Military, and Gunnery Items.

DURING the past week 39 wrecks have been reported, making for the present year 979.

THE annual regimental dinner of the 60th (King's Royal Rifle Corps) will take place on Wednesday, June 2, at the London Tavern.

It having been found that the rammers of Snider breech-loading rifles are apt to injure the barrels in cleaning, the square heads are to be filed round by armourer-sergeants of regiments, without expense to the public.

THE annual regimental dinner of the Royal Regiment of Artillery will take place on Tuesday, June 1, at Willis's Rooms, King-street, St. James, when the Duke of Cambridge, as colonel of the regiment, will

THE Lords of the Admiralty have accepted the tender of the Australian Meat Company, for whom Messrs. John M'Call and Co. are the London agents, for the supply of 200,000lb. of Australian preserved



THE French soldiers, acting in small parties, have been instructed to make a temporary rampart with their knapsacks, over which they throw their brown-coloured blankets. Behind this shelter they can crouch, either using it for the purpose of hiding them entirely from the enemy or for protection.

THE Soldiers' Monument at Rock Island, Illinois, was dedicated on the 9th ult. An imposing military parade took place, participated in by the United States troops, and a large number of citizens from Iowa and the surrounding country were present. The Hon. E. A. Storrs, of Chicago, delivered the oration.

An ironclad sloop of war, built by the Thames Iron Works and Shipbuilding Company for the Turkish Government, was launched from Blackwall on Wednesday week, and was named the "Avrii Illah." The Turkish Ambassador was present, and the launch was successful, the ship being christened by Mdlle. Musurus, daughter of His Excellency. The ship is of 1,400 tons; she carries four 12 long guns, in an apexagonal battery; and the armour plates are 6in. thick, with a 10-inch teak backing.

A FEBJEE Island correspondent of the "Honolulu Gazette" says there are at Libruka, on the Island of Ovalan, about thirty foreigners, all sailors, most of whom have run away from ships and turned Feejeeans. The principal man among them, and the one who has most influence with the chiefs—and, in fact, is a very respectable and steady man—is David Whiffey, who, thirty years ago, left a Nantucket whaler, and, making friends with the chiefs of Libruka, settled there. He has a number of wives and a large family.

The breaking up of the ice in the Volga has occasioned a serious accident near Nijni Novgorod, at the village of Pietchera. The blocks of ice carried down by the current have destroyed three steamers, one of 200-horse power, and the other two of 80 each. The iron shells of these vessels, the engines, and the boilers, were all smashed, and shortly afterwards sank. The loss is estimated at nearly £30,000. Eight boats and a landing erection in wood were also dashed violently against each other and broken up. Fortunately, no personal injury was sustained.

THE Board of Trade have awarded a binocular telescope to Captain J. B. Opisso, of the Italian barque "Franco," of Genoa, for having rescued the master and crew of the British ship "Sunderland," from their sinking vessel on March 14. The "Sunderland," soon after leaving Liverpool for Boston, experienced a heavy north-east gale, during which she sprung a leak, and the master finding all efforts to save her fruitless, abandoned her in lat. 49 30, long. 11 W. He and his crew, eighteen persons in all, were received on board the "Franco," and after being treated with great kindness were landed at Malaga on March 23.

THE "Devastation," one of the new turret ships ordered to be built, and referred to by Mr. Childers in his exposition of the Navy Estimates, will be constructed in No. 7 dock of Portsmouth yard, where half of her midship section has been temporarily set up in wooden batten frames. The side armour will project from the ship's hull proper, from a depth of oft. below the water line to deck level, somewhat on the principle adopted in the American navy for turret vessels. The "Devastation" will be commenced immediately No. 7 dock is vacated by the Royal yacht "Victoria and Albert," now being built there, whose date of completion is fixed for the end of the present month.

# Miscellanen.

ONE of the Nevada gold mines, the Yellow Jacket, was opened on the 18th ult., and it was found that the subterranean fire was still burning; but there were no indications of fire in either of the others.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending May 1, was 3.742. Total number since the opening of the Museum, free daily (May 12, 1858). 1,557,576.

UPWARDS of 100 gold coins, some of them belonging to the reign of Henry VIII., were recently discovered at Dunblane while an old house was being pulled down. The coins are in a good state of preservation. It is said that the value of the metal is about £80.

A PARLIAMENTARY paper has just been published, which shows the number of cotton, woollen, shoddy, worsted, flax, hemp, and other factories subject to the Factories Act in each county of the United Kingdom, and giving many other minutiæ respecting factories. In the whole kingdom there are 6,403 factories, in which 854,243 persons are employed.

YEARLY the quantity of wheat brought into this country from Russia increases. For instance, in February, 1869, wheat to the value of £469,099 was imported, against £368,960 in the corresponding period in 1861. Of course it is well known that our supplies of wheat from Russia are much in excess of other countries, even the United States.

The town of Chartres has voted the sum of £200 for the purchase of pictures at the exhibition, which opened there on May 1, at the same time as the regional agricultural exhibition. It is announced that the Empress, and probably also the Emperor, will pay the town a visit on the occasion of its combined exhibitions of industry, art, and archeology.

THE first public Acts of the present Parliament have just been issued in a new form. The cumbrous folio in which such acts have hitherto appeared has been superseded by a handsome imperial 8vo, in bold type, and with sufficient margin. We understand that this convenient form has been adopted in connexion with a revised edition of the statutes which is being prepared for publication.

A CURIOUS experiment is said to have been recently performed in France to ascertain whether fishes can live in great depths of water. The fish were placed in vessels of water made to sustain 400 atmospheres, under which they lived and preserved their health. It is therefore concluded that fishes may penetrate to very great depths in the ocean with impunity.

The higher ranges of fells and mountains around the lake district of Westmoreland were covered with snow on Monday morning to the depth of 3in. or 4in. The cold was remarkable. During the day heavy falls of rain occurred, accompanied by a sharp breeze from the north-west. On Saturday the thermometer registered 90deg. in the sun; on Sunday the mercury fell to below 50deg.

The number of visitors to the South Kensington Museum during the week ending May 1, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 12,978; Meyrick and other, galleries, 2,483; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,362, Meyrick and other galleries, 204; total, 18,027, Average of corresponding week in former years 12,362. Total from opening of Museum, 8,393,905

At the ordinary meeting of the Society of Engineers, held on the 3rd inst., Mr. F. W. Bryant, president, in the chair, a paper was read on "The Systems and Apparatus Employed for Illumination by Coal Gas," by Mr. William Sugg. The following candidates were balloted for and duly elected as members, viz., Messrs. W. Walker and J. T. Lloyd; as associates, Messrs. P. Gray and F. S. Ultzen. The ordinary meetings of the Society were adjourned until Monday, October 4 next.

It has been determined by the Sheffleld, the Great Northern, and the Midland Companies to proceed with their new joint line from Manchester to Liverpool, the three companies having concurred in releting the works which they believe can now be executed upon more favourable terms. On Monday, in consequence, the directors of the Manchester, Sheffield, and Lincolnshire Company issued their allotment letters for £1,000,000 new ordinary stock, at 50 per cent. discount.

THE heads of the French Post Office and of the Telegraphs have concerted together on the terms of a bill to permit the transmission of money orders by telegraph. The sum deposited will have to be described in the message both in writing and figures, and all the rules now in force, as well as the tariffs, will be applicable to these dispatches, which on arrival at their destination will be sent to the Post Office, and notice given to the person to whom they are addressed.

REPORTS are again current in the Californian papers of great discoveries of gold in Alaska, the territory recently acquired from Russia. They are stated to have been made by a Russian engineer, who was prospecting in consequence of having obtained specimens from the Indians. On account of the climate, however, the mines can only be worked five months in the year, and the hard and uninviting character of the country is considered likely to preclude any very general attempts for their development.

WE are informed that the great project for the construction of the Darien Canal, discussed by us in our issue for March 12 last, has fallen through. It appears that the congress of the United States in session at Bogota has rejected the treaty, as has also thecongress at Washington. Here, then, is an opportunity for English engineers, contractors, and capitalists to carry out this important undertaking, in which they can have the co-operation of an influential company which has already been formed in New York, and which has funds at its command.

WE learn that a bill for the inspection of steam boilers has been introduced into the Pennsylvania Legislature. It provides that within thirty days the Governor shall appoint one suitable person, to serve for three years, in each Congressional district, as inspectors. They shall examine all except locomotive and low pressure boilers, and shall keep a "lock up" safety valve on each boiler. The owners shall have their boilers ready for inspection when notified, and shall pay four dollars for inspection and shall attach a low-water indicator, connected with the steam whistle.

THE "Moniteur" announces that on Sunday week the Emperor Napoleon gave a private audience to Lord Richard Grosvenor, as the promoter of a proposed submarine tunnel between Calais and Dover. The "Moniteur" does not pretend to state what passed at this interview, but it believes that his Majesty considers the tunnel scheme to be beset by difficulties; while, on the other hand, he thinks highly of the bridge over the Channel projected by M. Boutet. He even suggested, on seeing the model of the bridge, that the number of piles on which it is to be supported should be doubled.

An interesting meeting, "Concours Regional," was held last week in the department of Moulins Allier. An unusually keen competition took place for the prizes for ploughing, particularly for the best deep ploughing (charrue profonde). In the best agricultural districts of France the ploughing is much deeper than is practised in England. The native manufacturers had evidently made considerable progress since the International Exhibition of 1867; yet they fell far short of their old rivals, the Howards, of Bedford, who again carried off the first prize, and who succeeded in turning the soil well over to a depth of 16in.

THE Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessels cruising the Channel between France and England. The steamer is not to e xceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before November I next, with a sealed envelope, giving the name and address of the designer.

At the meeting of the Institution of Civil Engineers, on Tuesday, the 4th inst., Mr. Thos. Hawksley, vice-president, in the chair, the following candidates were balloted for, and declared to be duly elected, including nine members, viz.:—Mr. V. G. Bell, Mr. V. Browne, Mr. B. S. Brundell, Mr. J. B. Eads, Mr. C. C. Fishe, Mr. G. Fisher, Mr. F. W. W. Luders, Mr. R. Moreland, and Mr. B. Samuelson, M.P. Eleven gentlemen were elected associates, viz., Mr. J. C. Bunten, Mr. J. Collinson, Mr. E. G. Davenport, Mr. A. C. Jenour, Mr. H. de la Poire Murphy, Mr. J. Noble, Mr. F. B. Passmore, Mr. T. C. Rayner, Mr. A. Terry, Mr. A. A. Wickenden, and Mr. J. S. Winbolt, M.A. The council have recently admitted Messrs. A. S. Busk, J. Doull, and C. P. Gibbons, as students of the Institution.

At the general monthly meeting of the Royal Institution, held last Monday, Sir H. Holland, Bart., President, in the chair, the following vice-presidents were nominated for the ensuing year:—The Duke of Northumberland; Mr. William Spottiswoode, F.R.S., the Treasurer; Mr. J. P. Gassiot; and Mr. G. Busk. Lieut.-Colonel Archibald Campbell Campbell, Sir William Dickason Clay, Bart., Mr. W. W. Ford, Mr. J. B. Marsden, and Mr. Herbert Schloss, were elected members of the Royal Institution. Professor J. Tyndall, LL.D., F.R.S., was relected as Professor of Natural Philosophy. The managers announced that in conformity with the deed of endowment, they had appointed Michael Foster, M.D., F.L.S., Fullerian Professor of Physiology.

The value of the principal (the enumerated) imports into Belgium in January, 1869, shows an increase of 11 per cent. as compared with January, 1868; and the principal exports an increase of 16 per cent. The increase of exports is very marked in the items of glass, paper, eggs, beetroot, sugar, and wheat. There is a large increase in the export of iron rails, sheets, wire, and nails, and in the import of iron ore. The export of machinery amounted to 411,062 kilogs., and the import of 341,193 kilogs., 264,255 kilogs. of this last item being from the United Kingdom; the export of machinery was chiefly to Zollvercin States, France, and Holland. There was an increase in the imports of soda, barley, fish, flax, copper, rice, and oil seeds; and the import of textile manufactures shows an increase.

The velocipedomania is still spreading. Last winter an ice velocipede, running on steel slides and propelled by means of a wheel furnished with sharp points, was brought out at Stuttgart, but it was much objected to by skaters on account of its spoiling the ice. We now hear that a party of Prince Napoleon's aides-de-camp have made a trip from Nice to Villafranca on water velocipedes. These machines consist of two miniature parallel cances which support a sort of chair; the paddle-wheel, placed between the cances, is propelled by the feet only, and is covered like the paddle-wheel of a steamer to protect the driver from the water it throws up. Their speed is said to be very great. It now remains, says the "Pall Mall Gazette," for the Aeronautical Society to adapt the velocipede to travelling through the air.



# Patents for Inbentious.

### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment: ment:

ment:—
BOILERS AND FURNACES—3213, 3232
BUILDINGS AND BUILDING MATERIALS—3191, 3231
CHEMISTRY AND PHOTOGRAPHY—3202, 3203
CULTIVATION OF THE SOIL, including agricultural implements and machines.—3225
ELECTRICAL APPARATUS—3224
ELECTRICAL APPARATUS—3225
ELECTRICAL APPARATUS—3224
FIBROUS FABRICS, including machinery for treating fibre pulp, paper. &c.—3185, 3186, 3187, 3199, 3219, 3221, 3243, 3244, 3244, 3249, 3259
FOOD AND BRUERAGES including the apparatus for year

FOOD AND BEVERAGES, including the apparatus for pre-paring food for men and animals—3184, 3194, 3204, 3220, 3250

3250
FURNITURE AND APPAREL, including household utensils time-keepers, jewellery, musical instruments, &c. ... 3189, 3193, 3207, 3208, 3209, 3211, 3212, 3215, 3216, 3217, 3246, 3253, 3261
GRNERAL MACHINERY —3183, 3205, 3206, 3210, 3214, 3228, 3229, 3230, 3235, 3239, 3252, 3255
LIGHTING, HEATING, AND VENTILATING—3176, 3180, 3190, 3198

3198
METALS, including apparatus for their manufacture—
3181, 3237, 3240, 3247, 3248, 3254, 3256
MISCRLLANEOUS—3175, 3177, 3178, 3242
BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—3179, 3188, 3195, 3201, 3227, 3234, 3257
SHIPS AND BOATS, including their fittings—3200, 3226, 3251, 3258
STRAM ENGINES—3174, 3197, 3233, 3241, 3260

, 3235 | Engines—3174, 3197, 3233, 3241, 3260 | Are—317**3,** 3182, 3192, 3196, 3222, 3223, 3236

3173 C. Churchill, Norwood. Breech-loaders. (A communication). Dated October 16, 1863.

The breech-piece is formed upon a tail-plate, and carries tubes or nipples which communicate directly with the interior of the barrels. The breech-piece extends forward, forming a frame to which the barrels are hinged; projections formed on the under side of the barrels, which, when the breech is closed, lies in a corresponding recess in the frame. A bolt passes through the breech-piece into a-hole in the rear of the barrels when the breech is closed, and thereby locks the barrels firmly, and keeps them from being accidentally raised. To operate the said bolt to release the barrels, the patentee piaces in the rear of the same a sliding bar, which extends down through the trigger guard plate, and is provided with a finger plate, whereby it is manipulated. The bar is forced downward by means of a spring. The upper end of the bar is forked, so that one leg passes up on each side of a flattened portion of the locking bolt. The rear surface of this forked portion is inclined, and a head or pin on the bolt rests upon the inclined surface, so that by moving the bar upward, its inclined portion acts on the head of the bolt, the same being thereby drawn back, and the barrels released.—Patent completed.

3174 L. ASHCROFT, New York, U.S.A. Safety valves, Dated

October 18, 1868

October 13, 1868.

This consists in the construction of the valve and its seat, and their relation to each other, and in the arrangement of the same, and its sustaining dome and inclosing case in such manner that the steam shall be at all times in direct communication with the face or faces of the valve by means of circular openings in the valve seat, into which steam is directly admitted from the boiler through the dome and through inlet openings in the steam chambers of the valve seat.—Patent completed.

3175 A. DENAYROUZE, Paris. Dresses for divers. Dated

r 16, 1869

October 16, 1869.

The improved dress for divers is made of india-rubber or other similar waterproof material, and has sleeves and cuffs. A collar of elastic fabric is sewn or otherwise attached to the neck. The horizontal portion is perforated with holes. The helmet or head-piece for divers consists of two parts—a spherical part, which covers the face and back of the head, and a collar or neck-piece. The spherical part has holes in it, in which eye glasses are placed. The bottom of the spherical part and the top of the collar or neck-piece are fitted with rings, in which are holes corresponding with those on the collar of the dress; these rings are covered with caoutchouc.—Patent completed.

dress; these rings are covered with caoutchouc.—Patent completed.

3176 J. PHILLIPS, Hampstead. Warming and ventilating. Dated October 16, 1863.

The hot water pipes conveying the upward and downward currents between a boiler below and cistern or expansion chamber above, are enclosed within air tubes or passages, which may be placed or constructed within the partition or other walls of a dwelling house or other building. Openings are formed into the air tubes by preference in or near the ceiling of each room with which they communicate, through which openings the vitiated air passes into the air tubes and away to the outlet through the roof, a strong upward current being produced in the air tubes by the expansion of the air therein caused by the heat evolved from the surface of the hot water pipe enclosed within such air tube or passage.—Patent abandoned.

3177 E. T. HUGRES, Chancery-lane. Adhesive substance. (A communication). Dated October 17, 1868.

The skins of rabbits are chopped or cut up into small strips or filaments placed in a water bath and boiled. This solution is then emptied into any suitable vessel perforated at the bottom, so that the juice or liquid portion of the solution may flow through the perforations into a vessel provided for the purpose, and a solution of about four parts of sulphate of zinc to one of alum is added thereto while the liquid portion of the before mentioned solution is still hot. This mixture is well stirred, and

passed through a sieve, after which it is emptied into a passed unrough a sieve, after which it is emptied into a rectangular or other shaped box, in which it is left to solidify or congeal. The congealed mass is then cut in two pieces, and each piece placed in a suitable box, where it is again cut up into thin leaves or cakes of the required size, which are afterwards dried.—Patent completed.

It is again out up into thin leaves or cakes of the required size, which are afterwards dried.—Patent completed.

3178 C. Mayer, Fleet-street, E.C. Tourist's boilles. Dated October 17, 1868.

This relates partly to bottles or flasks to be carried about the person, and also to a metallic stopper of peculiar construction, which may be applied to such bottles. The stopper is constructed in two parts, one of which is firmly fixed in the bottle or other vessel, and forms the seat for a lid or cover, which is hinged or jointed to the said seat. The latter has a circular recess or channel in its face, and the cover is formed with a circular projection or lip to fit into the recess, which is provided with a ring of indiarubber or other suitable elastic material, whereon the projection of the cover is tightly bedded when the stopper is closed. A ring or collar is fitted to turn freely upon the outside of the seat of the stopper, which ring is formed with one, two, or more wedge-shaped projections. The lid or cover is provided with a corresponding number of hooked pieces, which, when the cover is down upon its seat, is just opposite the ends of the inclined projections on the ring. In applying the improved stopper to a tourist's bottle, a tube or nipple is employed in combination with the stopper, which may be readily opened or closed by means of a plug or otherwise. The bottle is filled through the stopper, and then close and secure the same in the manner described.—Patent completed.

3179 D. Wilson, Dundee, N.B. Drag or brake. Dated October 17, 1868.

same in the manner described.—Patent completed.

3179 D. WILSON, Dundee, N.B. Drag or brake. Dated October 17, 1868.

The apparatus is situated to act upon the inner end of the naves of the wheels, and is wholly or partly held in place by a rod at the end next to the rear of the vehicle. It consists of a drag strap, which surrounds the inner hoop of the nave, and through which a screw shaft passes, situated underneath the body of the vehicle. A wheel is placed at the end of the shaft, by which it is revolved and the screw brought into action in the following manner:—As the drag screw is rotated it is forced backwards against the nave of the wheel at the same time that the rear end of the drag is drawn tightly against the opposite side of the nave, so that the nave becomes firmly held thereby, the object being to retard the vehicle in going down a hill and the wheel may be either fixed so as not to revolve when the drag is put on, or it may be allowed to revolve under friction slowly.—Patent completed.

3180 A. DESBONNET, Brussels. Lighting apparatus.

under friction slowly.—Patent completed.

3180 A. DESBONNET, Brussels. Lighting apparatus.
Dated October 17, 1868.

The object of the invention is to construct a protecting vase in such a manner that no shade will be thrown therefrom. This is effected by constructing the body of the lantern of one piece of glass of a circular or other convenient form, and supporting it either by a ring from above or by a light tripod frame below.—Patent abandoned.

or by a light tripod frame below.—Patent abandoned.

3181 W. T. RICHARD and W. C. PAUL, Moorgate-street, E.C. Washing ores. Dated October 17, 1868.
This consists in a trough or receptacle having, by preference, a semicylindrical bottom, provided with a recess or channel at its lowest part for the reception of the amalgam containing the gold or other metal, and from which the amalgam can be drawn off and the gold or other metal separated therefrom. In this trough or receptacle is placed a screw, formed of copper or other metal or metals, or metallic alloy or alloys, arranged in suitable bearings, either vertically, horizontally, or diagonally, as may be desired, and being capable of revolving continuously in one direction, or of having its motion reversed by means of any motive or driving power. The blade of the screw is so mounted upon its spindle or axis that only a space of from lin. to 2in. is left between the several surfaces of which the thread of the screw is composed. A larger extent of surface is thus obtained than in any of the machines for similar purposes in which screws have been employed.—Patent completed.

2182 E. Ludlow, Birmingham. Breech-loading cartridges.

2182 E. LUDLOW, Birmingham. Breech-loading cartridges.
Dated October 17, 1868.
The pulp or wasd of the cartridge is placed outside the metallic head or base containing the gunpowder, and the cup or tube for holding the anvil and percussion cap is made in one piece with the metallic case of the cartridge.

Bettert beneficial. -Patent abandoned.

-ratent abandoned.

3183 H. Bunning, jun., New Cross. Burning liquid combustibles. Dated October 17, 1868.

This relates to a former patent, dated February 5, 1868 (No. 393). The box or retort described in the specification of the former patent is provided with a reservoir at the top, into which the gas or vapour from the zig. zag passage passes, and from which it enters the burner passages, which now are formed as part of the box or retort in place of being separate pipes, as before. These passages run along either side of the box or retort near the bottom, and are perforated for the gas or vapour to escape.—Patent are perforated for the gas or vapour to escape.—Paten abandoned.

abandoned.

3184 F. P. WARREN, Lee, Kent. Cooking apparatus.
Dated October 17, 1868.

This consists in a peculiar combination of steam jacket ovens or cookers with the fireplaces and boilers of cooking ranges. In constructing a range according to this invention, the upper or steam space or spaces of the boiler or boilers communicate by a suitable pipe or opening with a hollow space or casing surrounding the oven or cooker, so that flesh and other food may be cooked without danger of being burnt, or subjected in the process to a more than sufficient heat, and so as also to avoid the absorption of moisture, the boiling or stirring thereof being effected by the steam or vapour given off by the evaporation of the fluids contained in such flesh or other food, without its being placed or coming into contact with water for that being placed or coming into contact with water purpose.—Patent completed.

3185 R. A. GREEN, Strand, W.C. Printed sheets. Dated

3185 R. A. Green, Strand, W.C. Printed sheets. Dated October 17, 1868.

The object is the facilitation of the folding and separation of paper sheets. The papers are punched or perforated with numerous holes along the lines of fold, which have to be afterwards separated. The paper is thus weakened along the lines of perforation and can be more easily folded and torn apart.—Patent completed.

employment of an adjustable expanding and contracting employment of an adjustable expanding and contracting series or rows of guides, through which the warp threads pass as they are delivered on to and received by the beam. These expanding and contracting guides are governed and receive their motion in the following manner:—The rail to which the guides are secured is jointed or otherwise constructed so that it will be capable of causing the guides to give a slightly contracted or expanded direction to the yarn, from the centre of the beam to its outer flanges, the motion being derived through the medium of a spring lever, secured on each side of the machine, which are secured to the ends of the guide rail, their opposite ends beyond their fulcra being provided with bowls, which are brought into foreible contact by means of a spring with the outer surface of the beam flanges.—Patent abandoned.

3187 T. WRIGLEY and J. RICHARRON. Manchester.

3187 T. WRIGLEY and J. RICHARDSON, Manchester.

Looms. Dated October 19, 1863.

This consists in regulating and maintaining at one uniform tension the warp threads of looms as they are delivered from the warp beam by self-acting means.—

Patent completed.

Patent completed.

3188 J. COCKSHOOT, jun., and H. WEATHERILL, Manchester. Carriage axles. Dated October 19, 1868

This consists in forming or constructing the back flange plate of the axle solid, so as to form a component part of the axle, in controlistinction to forming such flange or plate loose, and which in the old construction of mail axle is known as the back plate. This solid flange is formed with a recess or annular space around the axle arm, at the root, on its outer surfaces, towards the nave, the arm of the axle projecting outward from the recess to its termination at the extremity of the nave, where it is enclosed by the sleeve or box and the cap in the ordinary manner. The box or sleeve of the axle is secured in the nave of the wheel.—Patent shandoned.

nave of the wheel.—Patent abandoned.

3189 B. Hunt, Lincoln's Inn. Scisors. (A communication.) Dated October 19, 1808.

This consists in the combination with a pair of scissors of a gauge or measure, by means of which bands or strips of any desired width may be cut from any fabric, paper, or such like material, on a line parallel with the edge of the same. This is accomplished by attaching to one of the blades of a pair of scissors a gauge or measure, which may be secured to the blade in any suitable manner, so that the same may be adjusted laterally at right angles with the blade.—Patent completed.

2100 A. CLARK Chancervlana. Submarine lasterns.

with the blade.—Patent completed.

3190 A. CLARK, Chancery-lane. Submarine lanterns.
(A communication.) Dated october 19, 1868.

This consists in the application to a lantern of an improved means for supplying air, for the purpose of combustion, and also for the protection of the lamp. Also in improved means for supplying the lamp with gas, from a reservoir above the surface of the water. Also in the application of a telescopic attachment for the better observance of the objects to be inspected.—Patent completed. pleted.

pleted.

3191 C. Whitehouse, Bridgtown. Auger. Dated October 19, 1869.

The inventor forms, in the ordinary way, of sand, or other material, parts of a mould which are formed upon a pattern auger. He prefers to make the mould in two parts, but does not limit himself thereto, as, where the form of the auger requires it, the mould may be made in three or more parts. Having put the parts of the mould together and secured them in position he pours into the mould metal, steel, homogeneous iron, or other compound of iron and carbon having the nature of steel, or which, by subsequent treatment, can be converted wholly or superficially into steel. After the solidification of the melted metal, the mould is opened and the auger cast therein is removed therefrom. The auger is afterwards annealed by being heated in contact with the hematite iron ore, or other iron ore of similar composition. The steel or iron of which the auger is made is thereby wholly or partially decarbonized or softened. A number of the cast augers are then shaken in an ordinary shaking tub, by which the particles of sand or iron ore attached to them are removed, and the augers partially brightened. While the auger is still in a soft state the inventor bores, files, or otherwise fashions any part of it which may require a change of form.—Patent completed.

3192 W. E. NEWTON, Chancery-lane. Gun barrels. Dated

3197 W. E. NEWTON, Chancery-lane. Gus. carrets. Dated October 19, 1868.

This relates to a patent, dated May 5, 1868 (No.1475), and consists mainly in the form, arrangement, and mode of using the dies, whereby the several parts of the 1ed hot blank of iron, or other metal, are pressed or moulded into the required form.—Patent completed.

the required form.—Patent completed.

3193 W. H. Howes, Shoreditch. Swing frame glasses,
&c. Dated October 19, 1863.

Instead of employing the ordinary scrows and nuts, or
the cup and ball action now in use, the inventor forms one
part of the movement with a cylindrical stud or pin, which
passes through a corresponding hole or bearing formed in
the other part; and in order to enable the swing frame to
rest in any position to which it may be turned, he employs a washer, formed to fit a square formed on the outer
end of the pin, and passes a screw into the end of the pin,
to force the washer up to the bearing, and at the same
time to bind the bearing to the extent required between
the washer and a shoulder formed on the pin.—Patent
completed.

completed.

3194 W. R. LAKE, Chancery-lane, E.C. Preserving fish.
(A communication.) Dated October 19, 1868.

Fish, either fresh or salted, are taken, and all the skin and bones are removed from them. They are then put into a machine for grating or grinding, this process being continued till the fish is thoroughly broken up. The next process is to desiccate the fish thoroughly. This is done by spreading the mass upon a metal, stone, or other suitable surface, heated by means of steam pipes passing beneath the slab. The fish remains on this slab, and is subjected to a gentle heat until it is well dried and in suitable condition for packing.—Patent completed.

3195 J. RAE, Sydenham. Carts. Dated October 19

tion of paper sheets. The papers are punched or perforated with numerous holes along the lines of fold, which have to be afterwards separated. The paper is thus weakened along the lines of perforation and can be more easily folded and torn apart.—Patent completed.

3186 T. Wrigley and W. E. Yates, Manchester. Beaming the lines of perforation and continuous and perforation and can be more easily folded and torn apart.—Patent completed.

This consists, chiefly, in constructing carts with a tank can be conveniently filled through a manner that it can be conveniently filled through a suitable aperture, and can then be reversed or turned over the part of the cart may be readily and conveniently effected, and for replenishing the warp beams of looms with yarn preparatory to looming. The invention consists in the novel



and its load does not bear on the horse.-Patent com-

and its load does not bear on the horse.—Patent completed.

3196 W.Fitch, Washington, U.S.A. Gun carriages. (A communication.) Dated October 19, 1868.

This consists, first, in a novel method of constructing carriages for ordnance. Second, in a novel construction of the chassiz, and in the securing and arranging of the gun carriage thereon. Third, in providing the carriage and chassiz with devices for operating the gun. And, fourthly, in a novel method of checking the recoil of the gun and its carriage.—Patent completed.

3197 W. Dorr and J. Thornhill. Manchester. Motive power engines. Dated October 20, 1868.

This consists in connecting one or more extra cylinders to the ordinary high pressure cylinder, according to the requirements for the object in hand—that is, the steam exhausted from the first high pressure cylinder is received at the exhausted pressure, and made effective in the second cylinder at a pressure equalling that with which it escapes from the front cylinder, after which, if necessary, the latent power remaining in the steam may be further utilized, and its power made effective by again throwing it into a third cylinder, until the whole effective power of the steam is absorbed; or the steam, after having done service in the two cylinders—that is, with high and low pressure, may be exhausted in the ordinary manner. The fittings and construction of values and other gear is of the ordinary description.—Patent abandoned.

3198 H. A. BONNEVILLE, Parls. Sajety lamps. (A communication.) Dated Geober 20, 1868.

ordinary description.—Patent abandoned.

3198 H. A. BONNEVILLE, Paris. Safety lamps. (A communication.) Dated October 20, 1868.

This relates to the automatical extinguishing of mitners safety lamps, in the first place, when the accumulation of gases inside the lamp, by penetrating the wire gauze, increases the intensity of the flame and caloric, so as to heat the wire gauze red hot, or cause its rupture and the ignition of the gases outside, or when the miner attempts to open the lamp; and, in the second place, to obviate the danger resulting in the rupture or deterioration of the wire gauze when it presents a large surface.—Patent completed.

3199 J. Elge. Manchester. Mules. Dated October 20.

3199 J. ELCE, Manchester. Mules. Dated October 20,

3199 J. Elee, Manchester. Mules. Dated October 20, 1868.

The object of this invention is to regulate the amount of twist put in every stretch of yarn, and to check the momentum of the spindles when the carriage is at the end of its stretch, and when the twist at the head is completed. Another part of the invention consists in an apparatus for regulating the position of the driving straps, on the putting-up and winding-on pulleys. The invention is particularly adapted to the mules for fine spinning, known as box organ mules.—Patent completed.

3200 J. A. FARRAR and R. R. HUNTLEY, Hartlepool. Hatches. Dated October 20, 1868.

It is proposed to make hatches of iron or steel or other metal, and to fasten them to the combings by means of a clamp over the joining of each hatch. The hatches will be made water-tight by having india-rubber, gutta-percha, tarred felt, or leather linings or packings at every joint of the hatches, so that, when the clamps are on, the hatches are perfectly water-tight. On the top of one or more of the hatches or cabins it is proposed to have a manhole, of any height or width, made of iron or steed, or other metal, in a tubular or other shape, with four or more tubes or ventilators attached thereto, or making the manhole a ventilator by enclosing therein a smaller tube with openings.—Patent completed.

3201 G. VOHHT, Cahir, Ireland. Brakes. Dated October 30, 1868.

the manhole a ventilator by enclosing therein a smaller tube with openings.—Patent completed.

2201 G. Voight, Cahir, Ireland. Brake. Dated October 30, 1868.

This consists in continuing the shaft of the ordinary buffer through the cross head of the carriage, to a point near the centre midway between and above the axle. The termination of the buffer shaft slides in a tube supported in bearings, and connected by a centre shaft or rod under the cross bar, with which each carriage is provided. The termination of these shafts or rods is provided with buffers, and the rods themselves are connected by an arrangement of levers with the tube, in which the buffer shafts slide, so that when a forward movement is transmitted to the central shaft or rod, a partial turn is simultaneouly given to the tube. Connected to this tube is a lever that gives, when the tube turns, a rising motion to a vertical sliding bar, having an equi-distant position between the inner peripheries of the carriage wheels, to which rods the brake blocks supported in the ordinary manner are connected, the connection of such rods with the vertical sliding rod being somewhat below their point of connection with the block.—Patent abandoned.

3202 C. LAUENSTEIN, Manchester. Treating parafin.

rou being somewhat below their point of connection with the block.—Patent abandoned.

3202 C. LAUENSTEIN, Manchester. Treating parafin. (A communication). Dated October 20, 1868.

The inventor places in a number of chambers or receptacles, provided internally with spiral steam heating tubes, the solidified paraffin, preparatory to its undergoing the decolourizing process, when the paraffin is melted into a soluble state, in which state he causes it to be agitated, whilst there is added thereto about 10 per cent. of "residue phosphorus," which is the precipitate or coal-like residue left after the process of manufacturing phosphorus is complete. The liquid paraffin is then heated by the heating spiral steam pipe, for the space of about one hour, during which time, the solution becomes thoroughly impregnated with phosphorus coal; after a few hours' rest, the paraffin cools, and the phosphate coal settles partly down, after which the solution is drawn off into another receptacle or vessel.—Patent abandoned.

3203 G. CHAPMAN, Glasgow. Treating secage. Dated

3203 G. CHAPMAN, Glasgow. Treating sewage. Dated October 20, 1868.

This consists in a system, comprising the precipitation of solid matters, by means of lime or other alkaline agent, and the subsequent separation of the ammonia by distillation.—Patent completed.

tion—Patent completed.

3204 E. T. Hughes, Chancery-lane. Tea and coffee pots.
(A communication). Dated October 20, 1868.

This consists, first, in a hard metal body, lined with porcelain or similar material hardened thereon. After being so lined, the body is covered with a softer metal, such as Britannia metal or tin. Second, in the construction of a mineral or earthern pot or body, and covering the exterior surface with suitable metal which may be formed thereon.—Patent completed. -Patent completed.

thereon.—Patent completed.

3205 E. HARRISON, New Haven, U.S.A. Mills. Dated October 20, 1868.

This consists, first, in the arrangement of a bolt cloth or screen around the stones, so that the metal in passing from the stones is thrown against the bolt cloth, the fine or flour portion passing through the cloth to one exit, while the coarse or hull portion is driven out at another exit,

separating the one entirely from the other. Second, in constructing the husk for the runner casing with the supporting frame shaft bearings and sockets for the support of the hopper, and half of the discharge spout, in one and the same piece, whereby a large amount of fitting numerous boits and other expenses of combining the parts is avoided. Third, in casting the husks for the fixed or bed stone, the other half of the discharge spout, feeding spout, and bearing for the shaft, in one and the same piece. Fourth, in staching the hopper to the mill, by forming conical shafts upon the under side of the hopper, placing the said studs into sockets on the runner husk, and pouring metal around the said studs, so as to make a perfect fit and adjustment of the hopper, while the sockets are formed solidly on the husk. Fifth, in the arrangement of the rocker or feeding shoe beneath the mouth of the hopper, so as to be operated by an eccentric on the driving pulley, to vibrate or rock the shoe, to conduct the grain from the hopper to the feeding spout. Sixth, in fixing a band centrally upon the edge of the stones, so that they may be reserved and replaced in their proper positions, the two sides of each being parallel the one to the other; also in securing the stones one to the runner plate, the other to the bed stone casing by means of the said band.—Patent completed.

3206 J. Syrkes and J. Malin, Holborn, W.C. Pulisg-ts composition.

by means of the said band.—Patent completed.

3206 J. SYKES and J. MALIN, Holborn, W.O. Filling-incomposition. Dated October 20, 1868.

The composition intended for filling in the bodies of carriages, is composed of 2lb. of powdered rotten stone, 2oz. of powdered pummice stone, ilb. of white lead, three half pluts of gold size, and one half plut of turpentine, the whole thoroughly mixed together, after which the composition is ready for use.—Patent abandoned.

3207 J. LORKIN, Norwood. Pipes. Dated October 20,

1868.

This consists, first, in applying the light to the tobacco in the pipe at the bottom end thereof, instead of at the top, as usual, the pipe hanging down from the mouth vertically, instead of projecting horizontally, as nearly so, as at present; second, in purifying the smoke emanating from the tabacco, by causing the essential oils therefrom to be deposited on layers of material placed in a receptacle through which the smoke passes; and, third, in purifying the smoke emanating from the tobacco, by causing the essential oils to be extracted therefrom by chemical means.—Patent abandoned. -Patent abandoned.

essential oils to be extracted therefrom by chemical means.—Patent abandoned.

3208 E. T. HUGHES, Chancery-lane. Finishing needles. (A communication). Dated October 20, 1868.

The object of this invention is to polish needles after they have passed through the tempering and scouring process. The first part of the invention relates to mechanism for polishing or finishing the needles, and the second part to a device for separating the needles to present them all in the same position to enter the polishing machine, and the invention consists, first, in one or more polishing rapidly over the surface of a carrying band upon which the needles lie, and combined with a slide which moves transversely across the band, and resting upon the needles, so as to give to the needles a rolling movement as they pass beneath the polishing cylinders, so as to polish the entire surface of the needles. Second, in the arrangement of an inclined plane or table with the proper delivering device, so that as the needles are delivered near the higher end of the inclined table, they, by their own gravitation, will roll down the incline, turning by their own inclination, the head rolling faster than the point, so that the needles, the heads of which lie towards the right, will roll to the left side of the incline, and rice rersa, the heads all lying down the incline.—Patent completed.

\$200 D. and A. Posenel and M. Unguer, Aldgate. \$8ade helders. Dated October 20, 1868.

Patent completed.

3209 D. and A. POSENEL and M. UNGUER, Aldgate.

Shade holders. Dated October 20, 1868.

This consists in a kind of spring catch which projects
through the ear of the holder, and is pushed forward by
means of a coiled spring. When the shade or glass is to
be removed from the holder it will only be necessary to
draw back the spring catch, and the glass can then be
lifted off.—Patent abandoned.

3210 J. F. BRINJES, Whitechapel. Centrifugal machinery. Dated October 20, 1868.

The wire gauge or straining medium is made in the

3210 J. F. Brinjes, Whitechapel. Centrifugal machinery. Dated October 20, 1868.

The wire gauze or straining medium is made in the form of a number of endless bands or cylinders disposed around the drum in such a manner as to enable the endless bands or cylinders to receive a travelling movement of their own upon suitable carrier rollers, or in the case of wire gauze cylinders upon the axis of such cylinders mounted upon the drum. A simple and effective mode of transmitting the independent travelling motion to the endless bands or cylinders of wire gauze is to mount a vertical shaft in suitable bearings outside the main frame, and to impart motion to the second motion shaft by a strap from a cone pulley being mounted on the second motion shaft.—Patent completed.

3211 J. H. JOHNSON, Lincoln's Inn. Boots and shoes. (A

motion shaft.—Patent completed.

3211 J. H. Johnson, Lincoln's Inn. Boots and shoes. (A communication). Dated October 20, 1868.

This consists in so grooving the inner sole of a boot or shoe that it will form an elastic and yielding bearing for the foot; also in so forming such grooves in the counter or heel piece that they will communicate with those of the inner sole, and thus insure a thorough ventilation.—Patent completed.

3212 J. M. BRIERLEY and C. VINE, Bunhill-row, E.C.

3212 J. M. BRIERLEY and C. VINE, Bunhill-row, E.C. Corsets. Dated October 20, 1868.

The busk to one side, or one part of the busk of the stay, corset, or bodice, is provided with a series of movable catches, and the other busk, or other part thereof, is provided with a series of hooks or suitably formed projections adapted to be passed in or on to such catches to hold the parts together.—Patent abandoned.

parts together.—Patent abandoned.

3213 W. MAUDELEY and W. C. RAWLINS, Liverpool.

Furnaces and boilers. Dated October 20, 1868.

This apparatus is placed or constructed within the
furnace, and where a boiler is used it is connected with
the boiler so as to form a part of it. The apparatus has
air pipes, ducts, or spaces passing through the water or
conducting the air between pipes, ducts, or spaces containing water, which air pipes, ducts, or spaces have suitable openings conveying the air over and on to the coals
or fuel, thereby causing complete combustion of the gases
evolved from the burning fuel. The water from the boiler
is admitted to the apparatus and is made to circulate
through it.—Patent completed.

3214 J. Westwood. Bow. Socket totate. Dated Octo-

3214 J. WESTWOOD, Bow. Socket joints, Dated October 20, 1868.
In constructing these improved socket joints the inven-

tor forms a tube of wrought iron or steel, either by bending a plate of such metal and welding its edges together, or by coiling a bar of the same upon a mandrel and then welding it, or by welding together a series of rings or hoops of the required diameter. The interior of the socket or tube is bored or otherwise formed to fit the ends of the sections of the pile or column to be united. The socket may then be heated and tightly shrunk upon one of the sections. The end of the section to be united or coupled to this section is then inserted into the socket, the two ends being preferably made to but together. The inventor then drills holes through both the socket and the pile, into which holes he inserts keys, pins, or boits, which may be riveted or otherwise secured.—Patent completed.

3215 T. FORSTER and J. HEARTFIELD, Thornton Heath. ath gloves. Dated October 20, 1868.

2215 T. FORSTER and J. ILEANIFIED,
Bath gloves. Dated October 20, 1868.
In the manufacture of sponging or bath gloves the inventors employ sheets of india-rubber sponge, which is a porous vulcanized india-rubber. They cut the sheets to suitable forms and then cement the edges of the pieces with india-rubber cement made with benzole. When the cement is dry the pieces are stuck together, and then to make the joint secure they are treated with chloride of sulphur diluted with bisulphide of carbon, and thus the india-rubber films forming the joints are also vulcanized.—Patent completed.

2216 J. STAFFORD, Somers Town. Chimney terminals.

Patent completed.

3216 J. STAPFORD, Somers Town. Chimsey terminals.
Dated October 21, 1868.

This consists in constructing a cylindrical or polygonal tube, on the external surface of the upper end of which are fixed or formed a number of long vertical blades, arranged round the tube, and having a curved transverse section, the convex surface being presented towards the interior of the tube. These blades are of such a width that spaces intervene between the edges of each two, forming long narrow openings, which are covered by a corresponding number of other curved blades or shields, the concave surfaces of which are presented towards the openings, being situated a short distance from the same, while the edges of such shields overlap the hollow surfaces of the first-named blades in such manner as to leave other long narrow openings between such edges notice attracts of the first-mained obliges in such manner as to leave other long narrow openings between such edges of the outer shields, as also between these and the concave surfacer of the inner blades,—Patent abandoned.

3217 J. J. PARKES, Paddington. Stoves. Dated October

21, 1868.

This consists of a cylinder of wrought galvanized iron, which contains a compartment for the reception of dishes for baking and frying, and also of a kettle. The appliance of heat is conducted beneath, around, and above the compartment for baking or frying, and thence beneath and around the kettle.—Patent abandoned.

3219 J. HOLDEN, M.P., Keighley. Combing wool. Dated October 21, 1868.

3219 J. HOLDEN, M.P., Keighley. Combing seed. Dated October 21, 1868.

This relates to means or apparatus for combing wool and other fibres, in which are employed, in connection with the carrying or holding combs, other combs (which are called "nacteur" combs), whose teeth point in the opposite direction to and during part of their motion overlap the carrying combs, and relates to the use therewith of a guard plate, formed with a projecting ledge, in order that it may, whilst bearing against the carrying combs, give support or protection to the points of the "nacteur" combs during the drawing off of the fibre through the teeth of both combs. The plate extends in a direction from the point of tangence of the carrying comb and the drawing-off rollers to the part of the carrying comb at which the long fibres begin to be drawn through the two combs by the drawing rollers, and also to some distance in the opposite direction, and part of it is also formed to act in cutting off or arresting the drawing off from the carrying combs of the longer fibres or top.—Patent completed.

3220 H. CLIFTON, New Bond-street, W. Churns. Dated

pleted.

3220 H. CLIFTON, New Bond-street, W. Churns. Dated October 21, 1868.

This consists in an apparatus in which a stem or plunger, having at its lower end a perforated disc, or series of perforated discs, intended to be worked up and down within a cylindrical or otherwise shaped vessel, is used. The lower portion of the stem or plunger is made hollow, and at a point about midway of its length openings are made in it, leading into the hollow part for the admission of air. As the stem or plunger is raised, the disc or series of discs effect a certain displacement of the milk or cream in the cylindrical or otherwise shaped vessel, to supply the place of which air rushes through the said openings and down the hollow portion of the stem or plunger to the bottom of the churn, whence, partly by the weight of the fluid above it, and partly by the return stroke of the stem or plunger, it is forced through the milk or cream.—Patent completed.

3221 J. H. JOHNSON, Lincoln's Inn, W.C. Bobbiss. (A

or plunger, it is forced through the milk or cream.—Fatent completed.

3221 J. H. JOHNSON, Lincoln's Inn, W.C. Bobbias. (A communication.) Dated October 21, 1868.

This relates to improvements in reels or bobbins, whereby the ordinary wooden reels or bobbins at present in use, which possess the disadvantage of unnecessary weight, are replaced by lighter ones, which the inventor distinguishes by the name of the "Patureau bobbia." This improved bobbin is composed of cardboard, pasteboard, or other fabric capable of being shaped by dies and matrices in a stamping press.—Patent completed.

3222 T. RICHARDS and C. H. CARTER, Birmingham. Extractors. Dated October 21, 1868.

This consists in attaching in a suitable position, upon the forward portion of the body of a breech-loading pistol, a lever of suitable length in the direction of the barrel. This lever is for the purpose of working the extractor. The extractor consists of a slidding bar or blade, formed with a ram piece at one end, for entering the breech-loading chambers, and working horizontally in a suitable grooved recess in the body of the pistol by means of the lever already named.—Patent shandoned.

3223 H. C. E. MALLET, New Bond-street, W. Projectiles.

2223 H. C. E. Maler, New Bond-street, W. Projectiles.
Dated October 21, 1868.
This consists in providing spiral grooves (two or more in number) on the exterior of the hollow or other elongated projectile. The grooves commence at the front end or apex, where they are deepened, diminishing towards the rear end or base and terminating at a short distance therefrom, to prevent any escape of gas in firing, which exerts its whole force on the projectile as usual.—Patent abandoned. abandoned.

3224 E. O. W. WHITEHOUSE, Stoke Newington. Telegraph wires. Dated October 21, 1868.

This consists in the application of an external coating



for the protection of telegraphic wires, which have been previously insulated or coated, either by means of guttapercha, india-rubber, or otherwise, such protecting coating or covering being composed either entirely or in part of compounds or combinations consisting essentially of xyloidine, in conjunction with volatile solvents, oils, resins, tar, asphalte, pigments, or other similar bodies. As an example of the combinations or compounds which are employed, the preparation of a combination of xyloidine with oils, parafflo, pigments, &c., with the employment of a volatile solvent may be given. The gun cotton or xyloidine is, by preference, used in a dry state, but humid gun cotton may be employed.—Patent completed.

3225 H. Warrer, Old Jewry, E.O. Moving machines. for the protection of telegraphic wires, which have b

humid gun cotton may be employed.—Patent completed.

3225 H. WARNER, Old Jewry, E.O. Mowing machines.

Dated October 21, 1868.

To convert a lawn mowing machines into a sweeping machine, the inventor takes from the machine the cutting spindle, which carries the cutting blades set spirally around it, and in its bearings places a spindle fitted with the brushing apparatus, and also fitted with a pinion or pulley at its end, so that the brush spindle may be driven by the same means as was employed for driving the cutting spindle. To again convert the machine into a lawn mowing machine the brushing spindle is taken out and replaced by the cutting spindle.—Patent completed.

2228 C. McMully Sundarland. Protecting from white.

3226 C. McMillan, Sunderland. Protecting from ships. Dated October 21, 1868. The invention consists in a compound of gutta-percha

and resin in equal proportions. These materials are boiled together, using, however, only so much heat as is necessary to admit of the complete mixture of the ingredients, which are stirred and worked together until they are completely incorporated.—Patent completed.

pletely incorporated.—Patent completed.

3227 W. K. Foster, Massachusetts, U.S.A. Carriage wheels. Dated October 21, 1868.

This consists in an arrangement of the ends of the felloe, so as to be supported by the ends of male contracting screws or by plates of metal separate from the nuts of such screws, and placed between the two, and sustained by the screws. Also, in the formation of the halves of the nuts, with recesses in their inner sides, such being as hereinster explained. Also in making the tyre with its inner surface concave transversely to fit to a corresponding convexity of the felloe. Also, in the formation of the block, which is arranged between the ends of the tyre, with a recess on its lower side, in combination with the formation of the outs, with counterparts to enter such recess. Also, in the combination of braces with the tyre, the nuts, and the right and left hand screws thereof.—Patent completed.

3228 F. Benner and R. Wood, New Broad-street, E.C. Capture of whales. (A communication). Dated October 22

1868. This relates to a method of capturing whales and other fish or animals, by the agency of electricity, galvanism, or magnetic electricity, and consists in placing in the boat or whaling vessel, as may be found most convenient, as galvanic battery with its coil and necessary accompaniments, or any other known electrical apparatus, of any required intensity, properly insulated wires being in connection with and passing from the opposite poles or terminals of the said battery or other galvanic apparatus, and inside of or along the line or lines by which the harpoons or other instruments are secured to the boat, the ends of such wires being continued to the points of the harpoons or other instruments, so that the points are in direct communication with the poles of the battery or other galvanic apparatus.—Patent completed.

\$229 B. J. Winslow, Twickenham. Convexing rotary

ratus.—Patent completed.

3229 R. J. Winslow, Twickenham. Conveying rotary motion. Dated October 22, 1868.

This relates to a patent, dated January 25, 1868. Instead of the ratchet pawl and device for lifting the pawl on and off the ratchet, as set forth in the last mentioned letters patent; a flexible band, such as a chain, strap, gutline, or other pliable material is used, one end of which is fastened to the drum, which is described in the specification of the letters patent, or to a loose pulley used to give rotary motion to the axie; the other end of such band afterit has been wound several times round the axie, is attached to a drag, having a movement independent of the drum and axie.—Patent abandoned.

2220 M. A. F. MENNOSE Newstantment. Retiring sectors.

Patent abandoned.

3230 M. A. F. Mennons, Newgate-street. Raising water.
Dated October 22, 1868.

This consists in a cast-from chamber, constructed by the union of castings by bolts. There is a diaphragm of twisted cotton ducts of six or more layers held between two from plates, which are connected with the valve stem, which is provided on its lower end with a nut. There is, also, a pipe for the conveyance of steam into the chamber, and a cast-from base secured to a bowl by bolts. There is a tube, the upper end of which is used as a valve to close against the seat, and a spiral spring is set in this tube. An outlet tube provided with a check valve to prevent rea tube, the upper end of which is used as a valve to close against the seat and a spiral spring is set in this tube. An outlet tube provided with a check valve, to prevent return of water, furnishes a ready outlet for the water. There is a tube leading from one tube to the injector, provided with a valve. The exhaust air and hot water escape leads from hot well, and is provided with a valve

3231 J. RYDER, Manchester. Kilns. Dated October 22,

This consists in placing above the firebars of the different furnaces, a projection or shelving ledge, above which an open space is provided for feeding the fire with fuel.— Patent completed.

C. AKRILL, West Ham. Burning creosote. Dated 22, 1868.

2323 C. Arrill, West Ham. Burning cressole. Dated October 22, 1868.

The apparatus consists of two pipes terminating in nozzles; to one of these pipes steam is admitted, and it issues from the nozzle in the direction in which the flame jet is desired to be thrown, usually horizontally. This steam jet is made to cross the orifice in the nozzle of the other or second pipe, which is placed in close proximity to it at its point of issue, and then the steam jet produces a suction from the nozzle of the other pipe. This pipe is connected with a vessel containing the crossote or liquid to be burnt, and this vessel is usually placed below the nozzle, and the suction draws the liquid from the pipe and causes it to issue from the nozzle in a small stream, and this stream being struck by the steam jet issuing at great velocity at an angle to the direction at which the liquid fuel issues from its nozzle, breaks it up into the fine spray.—Patent abandoned.

3238 G. T. Bouspield, Brixton. Propelling. (A com-

3233 G. T. BOUSFIELD, Brixton. Propelling. (A com-nunication). Dated October 22, 1868. The first improvement is to enable a screw propelling.

arranged at the side of a vessel to receive and discharge the water with facility, although the propeller shaft is connected directly with the steam engine. And it consists in the combination of the hull of the vessel with a shaft ichamber placed at the outside of the vessel and containing the shaft of the screw propeller, and with an overhung screw propeller arranged at the end of the said shaft chamber. The second improvement consists of the combination of the hull of the vessel, exterior shaft chamber, and screw propeller at the rear thereof with a stay to sustain a portion of the weight of the propeller. The third improvement consists of the combination of the said hull of the vessel exterior, shaft chamber, and overhung screw propeller, with a guard above water. The fourth improvement consists of the combination of the said hull of the vessel exterior, shaft chamber, screw propeller, and stay, with a guard, as aforesaid. The fifth improvement consists of the combination of the hull of the vessel exterior, shaft chamber, and screw propeller with two cranks (for receiving the motive power), arranged diametrically (or nearly so) opposite each other so that the momentum of one portion of the propeller engine connected with one crank and moving in one direction, is counterbalanced in whole or in part by the momentum of another portion of the propeller engine connected with the other crank, and moving in the opposite direction. The sixth improvement consists in the combination of the hull of the vessel exterior, shaft chamber, and screw propeller, with pillowheat chamber and screw propeller, with pillowheat chamber and screw propeller, with pillowheat chamber and screw propeller, with the ment consists in the combination of the hull of the vessel exterior, shaft chamber, and screw propeller, with pillow-block frames or brackets of U form, arranged with the closed part of the frame at the exterior of the screw shaft. The seventh improvement has reference especially to the engine for driving the propeller, and consists of the combination of the crank shaft with two steam cylinders of unequal size (the smaller working steam of high pressure and the larger receiving the steam exhausted from the smaller), and with a single four-ported slide valve, which regulates the admission and exhaust of steam for both cylinders.—Patent completed.

cyinders.—Patent completed.

3234 C. D. Abel., Southampton-buildings. Railways. (A communication.) Dated October 22, 1868.

The principal feature of the system of railway forming the subject of the present invention consists in the employment of a continuous timber permanent way of such a width that it is capable of carrying both rails for the rolling stock to run upon. In the application shown, the timber way is represented by a rectangular beam, the ends of which are scarfed so as to form rigid end connections. This timber way is laid either loosely on the surface of the ground with comparatively slight transverse supports at intervals, or it may be fixed down upon piles or uprights; these supports may, on account of the rigid construction of the timber way, be at greater distances apart than those for ordinary railways.—Patent completed.

construction of the timber way, be at greater distances apart than those for ordinary railways.—Patent completed.

2235 T. Carr, Bristol. Disintegrating machinery. Dated October 22, 1868.

This relates to a patent granted to the same inventor, No. 778, and dated March 29, 1859. The present improvements, first, relate to a mode of constructing and arranging the cages of the machine so that increased strength may be obtained, and which admits of a ready application of bars or knives rotating with one or the other of the driving discs, instead of being fixed or stationary, for breaking up such lumps of material as will not pass through the immost cage, and this part of the improvements consists in securing the annular disc to the large disc, or in securing the annular disc to the large disc, or in securing the ring of the outer cage when carrying the annular disc to the large disc by bolts or screw nuts, or other suitable means. Second, the improvements consist in forming the bars of the cages of steel or of cast fron moulded upon cores of wrought iron in "chill," or other moulds, such compound bars being useful when the machine has to operate upon certain hard materials, and also in making such bars, whether compound or otherwise, of oval, square, rhomboid, or other section which will give increased strength to resist lateral percussion. Third, improvements consist in the use of several knives in place of one, as hitherto, for breaking up such lumps of material as will not pass between the bars of the inner cage. These knives may be bolted or otherwise secured together in a ring or rings so as to give strength and support to each other. Fourth, the improvements relate to such arrangement of the cages of a machine as will give larger capacity without increasing the length of the bars of the outer cage, and consists in dishing the large outer disc so that the luner disc may run clear, no that by this means the inner surfaces of the rings and discs are all brought in a line, and the edges are all of the same width a

3236 W. T. Carrington, H. Gieleud, and Z. S. Wesselley, Westminster. Firearms. Dated October 23, 1868. This consists in improved arrangements of breechloading firearms, wherein the opening of the breech for the introduction of the cartridge and the closing of the same subsequently at the same time effects the cocking of the gun ready for firing.—Patent abandoned.

3237 A. B. BERARD, Paris. Converting fron into steel. Dated October 23, 1868.

Dated October 23, 1868.

This relates to a previous patent granted to the same inventor, dated June 20, 1866. To obviate the difficulties that may arise in practice from the employment of a furnace with a double sole plate, in which two operations are combined, and must be conducted, so to speak, simultaneously, the inventor now makes use of a furnace with a single movable sole plate. This sole plate is worked by means of an hydraulic press, and may thus be lowered rapidly, raised or removed at will to be replaced by another.—Patent completed.

3239 T. WALKER, Birmingham. Lever buckle. Date October 23, 18

October 23, 1868.

The buckle or fastening consists of two separate pieces of metal, cut out and formed by press tools in the usual manner, and as well understood. One of these parts has a thin strip of metal left on each of its ends, which is afterwards folded over in such a manner as to form the hinge or joint in which the other part is to work. This other part, which, for distinction, the patentee call the male part, has a pin or axis formed at each of its ends, which takes into the hinge or joint formed in the first-named part, as before described, and works therein.—Patent abandoned. named part, as be Patent abandoned.

Patent abandoned.

3240 J. Birch. Newton Heath. Casting Bessemer isgots.
Dated October 23, 1868.
This consists in a novel arrangement of carriers or conveyers for the moulds, which will facilitate and expedite the process of casting so as to make the same continuous without intermission so long as the metal is prepared and ready to be delivered into the moulds. The invention consists in intersecting the casting pit at any one or more convenient portions of the circle described by the traverse of the crane and ladle, conveying the molten metal by an arrangement of revolving table or tables, the outer circumference of which is constructed so as to support and carry in their revolution a number of ingot moulds, which are capable, through the medium of such revolving turnables or carriers, of being successively brought under the outlet valve of the ladle traversing on the circle around which the first lot of moulds is arranged, thereby enabling a continuous flow of metal to be discharged into the moulds carried by one or more of such intersecting revolving tables.—Patent completed.

3241 W. W. Tonkin, Kingsland. Valves. Dated Oc-

3241 W. W. TONKIN, Kingsland. Valves. Dated Oc-

3241 W. W. TONKIN, Kingsland. Value. Dated October 23, 1863.
This consists in certain methods of constructing pistoms or slide valves, whereby the necessity heretofore existing of maintaining a constant pressure, slways acting in one direction, upon a small area, which is periodically overcome by a pressure acting in an opposite direction upon a larger area, is obviated.—Patent abandoned.

3242 J. DE REDON and T. FACHEUX. Cigars and cigarettes

3242 J. DE REDON and T. FACHEUX. Cigars and cigarettes Dated October 23, 1868.

This relates to improvements in the manufacture of cigars or cigarettes, and more particularly in the wrapper or outer covering, the use of paper in the construction of cigarettes being dispensed with. First, a leaf of tobacco is taken and the stalk and centre rib or fibre is extracted from it; it is then cut rectangular, the length of the cigar or cigarette laying flat on the board, and other substances gummed, pasted, or applied to the edges. The tobacco to form the interior of the cigar is prepared much in the same manuer as in making the ordinary paper cigarettes. It is rolled in the apparatus between the two boards, and when it arrives at the open wrapper, the latter curls itself round the tobacco, and the overlapping edge fastens itself along the surface.—Patent abandoned.

2243 J. Gregson and W. Monk, Lancaster. Looms

3243 J. GREGSON and W. MONK. Lancaster. Looms

3243 J. Greggon and W. Monk, Lancaster. Looms Dated October 23, 1868.

This consists in an improved method of working what is known as an under pick loom, and this is done by a metallic pick motion on each end of the tappet shaft, which motion is obtained by and through a cam on each end of such tappet shaft. These cams act on a bowl working on a stud connected with an horizontal picking shaft, to the ends of which is attached a swivel or universal joint, with catch box for holding the picking stick—Patent completed. completed.

3244 M. SAUTTER, Paris. Preparing wool. (A commu-

3244 M. SAUTTER, Paris. Preparing sool. (A communication.) Dated October 23, 1868.

This consists, first, in saturating the wool with the light vapours obtained from distillation of petroleum, naphtha, or other similar substances; and, second, in supplying oil to the wool in the form of vapour, after it has been properly cleansed, and before it has been converted into fabric. The apparatus consists in a retort, made of any desirable form and size, in which petroleum, naphtha, or other valatile cleaginous substances or compounds are placed, and subjected to the action of heat from any suitable furnace. The retort communicates with chambers or receptacles in which the wool is placed—Patent completed.

3245 M. SAUTTER, Paris. Bamboo fibre. (A communi-

pleted.

3245 M. SAUTTER, Paris. Bamboo fibre. (A communication). Dated October 23, 1808.

In the first place, the knots or joints are removed from the bamboo, which is then split longitudinally into strips by means of sharp-edged instruments arranged for the purpose. After removing the knots or joints, and splitting the bamboo, the lower and tougher portions of the bamboo are separated from the remainder. The bamboo is then boiled in caustic alkali of about 6deg. Beaume, in an open kettle, until the siliceous and gummy matter is softened. This operation requires from six to ten hours, according to the age and quality of the bamboo. The bamboo is pressed while hot for the purpose of expelling the water and so much of the siliceous and resinous matter as may be held in solution or combined with the bamboo. The bamboo is then again boiled in a weak solution of caustic soda for about three hours, and afterwards for about two hours in soap and water, which cleanses and softens the fibre without reducing it to apply condition or impairing its strength, which would be the result if longer boiled in caustic alkali.—Patent completed.

3246 C. B. James, Redditch. Needle-case. Dated Octo-

completed.

3246 C. B. James, Redditch. Needle-cases. Dated October 23, 1868.

Au outer cover, or case and sheath combined, is made of paper, silk, or other suitable material, so as to fold up and close with a tongue piece. From the inner side of the body of this outer case to which it is attached, strips of ribbon, paper, or other suitable material, passes into the sheath, where it is attached to the one side of the same, so that upon the descent of a packet or case of needles into the sheath, the material of the strip, such action tending to bring together and close the parts of the case, whilst the opening out of the same has a contrary effect, the strip being drawn out of the sheath, and consequently propelling or forcing upwards, and partially out of, the sheath, the pocket or case of needles which may be formed of paper, silk, metal, glass, or other suitable material.—Patent completed.

3247 J. Bernard, Strand, W.C. Dressing ore. Dated October 23, 1868.

October 23, 1868.

This relates to an improved stone, ore, or mineral break-ing or crushing machine, and consists of the use and



employment of a series of movable teeth or segments made of steel or other metal placed upon and secured in blocks or rollers containing suitably formed grooves or recesses for the reception of such teeth or segments, and admitting of their ready removal or renewal without involving the removal of the blocks or rollers from their shafts, or the shafts from their bearings. Second, the invention consists in imparting a lateral and differential motion to crushing rollers, which may be effected by means of a cam or eccentric secured to the shaft or shafts on which the rollers are secured, and which is so j. aced and arranged that its differential outline comes in contact with a fixed stud or pin in the course of its revolution, the objectof which motion is to cause the surfaces of such rollers to wear out more evenly. Third, the invention relates to an improved method and means of sizeing or dividing the materials, and consists in combining plain inclined surfaces with inclined perforated plates or sieves, over which the material to be operated upon is passed, and by which a more perfect result is obtained, the whole of the perforated plates, and plain inclined plates, being placed and arranged in a suitable framing common to the entire number employed, and leading into separate divisions or compartments in which the materials are deposited.—Patent completed.

2248 J. Ba668, Holborn. Smelting iron. Dated October 24, 1868.

BAGGS, Holborn. Smelting iron. Dated Octo-

3248 J. Baggs, Holborn. Smelting tron. Dated October 24, 1868.

In charging the furnace, the inventor generally, and by preference, in great measure, excludes and dispenses with the coal or coke usually thought necessary for smelting, and in place thereof he burns in the smelting furnace coal gas, hydrogen, carbonic oxide, or other combustible gas or gases, and also the vapour of petroleum, naphtha, and other hydrocarbons, under pressure and in combination with a blast of hot and cold air. In the case of the inflammable hydrocarbon vapours, the same may be forced into the furnace under the pressure of their own atmospheres, or by means of any suitable mechanical appliances.—Patent completed.

3249 J. Anderson, Ballymacarett, Ireland, Felts. Dated

3249 J. Anderson, Ballymacarett, Ireland, Felis. Dated October 24, 1868.

The ordinary fibrous or capillary substances used in the manufacture of felted materials are employed, but instead of combining the said substances, or causing them to cohere by means of some or one of the bituminous substances heretofore commonly employed for the purpose, they are saturated and combined, or caused to cohere, by means of the native mineral pitch known as asphaltum, specially prepared by purifying and mixing it with suitable tars or oils which have the effect of softening and tempering it. The substances which are applicable for softening and tempering the native mineral pitch known as asphaltum are shale, tar, paraffin, still bottoms, called also paraffin sludge or boghead tar, paraffin tar, Archangel tar, and asphalte oil, and analogous tars and oils.—Patent completed.

3250 J. Spratt, Holborn. Food for animals. Dated

Patent completed.

3250 J. SPRATT, Holborn. Food for animals. Dated October 24, 1868.

This consists in the introduction of the fruit of the date palm (Phonix dactylifera) into any or all of the ingredients to be used as food for horses and cattle. This fruit is to be mixed with flour, or other farinaceous substances, grains or seeds of all kinds, either moist or desiccated, particularly malt, chocolate or cocoa, berries, meat, or its residuum after boiling down (the meat being dispensed with when making up the compound for herbivorous animals), oil cake, sulphur, spices, and any saccharine substance to sweeten such compound.—Patent completed.

3251 B. Hunt, Lincoln's Inn. Power capstans. (A com-

animals), oil cake, sulphur, spices, and any saccharine substance to sweeten such compound.—Patent completed.

3251 B. Hunt, Lincoln's Inn. Power capstans. (A communication). Dated October 24, 1868.

This relates to various improvements in the method of gearing, and other peculiarities in the construction of power capstans.—Patent completed.

3252 R.J. Burn and S. Eyland, Bristol. Construction of conservatories. Dated October 24, 1868.

This consists in the total removal at will of all obstructions to the free growth of plants in conservatories, &c., in the form of glazed coverings, sash bars, or otherwise. This is effected either by removing bodily the whole of the covering portion of the house, by the expanding system, thus leaving the plants free and wholly exposed to the action of light and air, or by the system of shifting entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front covering glass by means of sliding entirely away the front one of which cylinders is engraved or embossed a pattern resembling linen or other similar material.—Patent abandoned.

2254 G. Nurse, Pontymister. Tinning metals. Dated

or other similar material.—Fatent abandoned.

2254 G. Nurse, Pontymister. Tinning metals. Dated
October 24, 1868.

This consists in constructing the apparatus in tinning
metal, in the form of a circular pot with a hollow centre
or otherwise, and with a frame or turntable caused to
rotate in the circular hot air chamber.—Patent completed.

rotate in the circular hot air chamber.—Patent completed.

3255 E. Wimeider, Great James-street, W.C. Blocks for surface printing. Dated October 24, 1868.

The design is drawn on a metal or other surface in ink, containing gum; the surface is then covered with Brunswick black, and afterwards washed, whereby the parts composing the design become bare. Acid is then applied to eat out the design to the required depth. A cast is then taken in metal, which will bear the design in relief; this design is covered with Brunswick black, and acid is then applied to the parts not forming the design.—Patent completed.

Dieted.

3256 A. Giraud, Gray's Inn-road. Separating silver.
Dated October 24, 1868.

The process is commenced by extracting as completely as possible, by any of the ordinary methods, the antimony which may be contained in the lead. Immediately afterwards, the lead is placed in any suitable vessel, but, by preference, in a melting pan, to which an opening is adapted at its base or bottom, in order to allow the fused metal to be run off as required. This melting pan or boiler may be set on an ordinary furnace, but, by preference, the furnace should be provided with a movable grate, which will facilitate the instantaneous extinction or removal of the fire.—Patent completed.

3257 W. Reid, Granton, N.B. Trucks or waggons. Dated

will facilitate the manufacture of the fire.—Patent completed.

3257 W. REID, Granton, N.B. Trucks or waggons. Dated
October 24, 1868.

This consists, first, in constructing the waggons or

trucks with troughs running round them, or across the ends or through the centre, having, by preference, an opening on the outer side for the convenience of supply, such troughs either forming a part of the waggon itself (and having a plug hole to allow the water to run off when it is necessary to clean them out), or being capable of removal therefrom, for cleaning or repairs; also in providing the waggons with racks for hay and straw, and with fixed or movable stalls for keeping the cattle separate when on a journey, and with louvres or other means of ventilation. Second, in erecting at railway stations, sidings or other suitable points on a line of railway a set of support posts or pillars to which are attached either hoisting gear or loading gear, or hooks, by means of which a trough or troughs, a rack or racks, or other receptacle for food may be used to a sufficient height to enable the animals when in the train to drink or feed therefrom.—Patent completed.

in the train to drink or feed therefrom.—Patent completed.

3258 W. G. JAMES, Queen's square. Propelling. Dated October 24, 1868.

It is proposed to mount upon the vessel or carriage to be propelled, a hollow chamber provided with five tubular branches, one of which is centrally placed in the front of the chamber, two are situate at right angles thereto (one on each side), and two more are situate in the rear of the chamber, branching therefrom on each side, at an angle of 60deg. from the longitudinal centre line of the chamber. Each of these branches are open to the atmosphere, and within each there is fitted an airtight piston. The two rear pistons operate as the drivers or propellers, as hereinafter described, whilst the other pair of side pistons serve to compensate the back pressure of the atmosphere against the front piston, when a vacuum is established by means of an air pump or otherwise, inside the said chamber.—Patent abandoned.

3259 S. CLARK, Rye. Decorticating cotton. Dated Octo-

3259 S. CLARK, Rye. Decorticating cotton. Dated Octo-

3259 S. Clark, Rye. Decorticating cotton. Dated October 24, 1863.
A flat board, which first receives the cotton in the pod, is connected to a perforated inclined plate or flat screen, which directs the cotton in the pod into the fixed semi-eyiludrical screen; stones and other like bodies are separated from the cotton pods, whilst they are being fed or moved along the inclined screen. From the end of this flat screen, the cotton in the pod enters into the fixed horizontal semi-cylindrical wire screen, within which rotates a shaft, carring a number of inclined or helical blades, forming a screw, which when rotated, moves the cotton and pods through the screen, the dry leaves, stalks, and such like refuse matter falling through the bottom of the screen, whilst the cotton passes onwards, and is discharged at the end of the said screen into a vertical hopper or shoot, where it encounters a revolving spiked cylinder, working in combination with a fixed inclined surface, also provided with spikes.—Patent completed.

3260 H. E. NEWTON, Chancery-lane. Steam pipes, (A.

provided with spikes,—Patent completed.

3260 H. E. Newton, Chancery-lane. Steam pipes, (A communication). Dated October 24, 1868.

This relates to the kind of pumping engine known as direct and double acting. The main valve is worked by the direct action of steam, admitted and exhausted therefrom, by the action of auxiliary valves, which derive their motion in one direction from the steam piston, and in the other, by the action of the steam and by gravitation.—Patent completed.

3261 H. MAYHEW, Bloomsbury. Button fastening. Dated

3261 H. MAYHEW, Bloomsbury. Button fastening. Dated October 24, 1868.
This consists of a thin piece of metal, bent into the form of a slide, which has a ring at the top. The button shank is passed over one of the prongs of the slide up to the rings, when the sides of the slide or fastener are separated, and the button held in the fabric.—Patent completed.

and the button held in the fabric.—Patent completed.

3262 W. E. GEDGE, Wellington-street, W.C. Glore fastening. (A communication). Dated October 24, 1868.

This is composed of a cord or band fitted to the glove by means of an eyelet hole or plate attached thereto. This cord or band, the two ends of which have been joined, slides at will into a piece of the glove, and is then passed through an eyelet placed at the other side of the glove, a tassel or other suitable object being applied to prevent its return. On this cord or band is placed a movable pivoting or balance catch made slightly conical having a slot through it, and carrying at one of its ends two claws which come down and seize the two cords or bands forming the fastening of the glove. Two holes are pierced in the upper part of this catch, and serve to fix it to one of the cords; the other is passed into the slot, in which it slides freely.—Patent abandoned.

3263 J. L. KIRFFER, Haguenau. Sewing machines. Dated

3263 J. L. KIEPFER, Haguenau. Sewing machines. Dated

3263 J. L. KIRFFER, Haguenai. Secong machines.

October 24, 1868.

There is a notch or slot in the cylinder or cam, which drives the shuttle, so arranged that the shuttle starts to enter the loop as soon as the needle has formed it, and returns before the stitch is tightened up. The shuttle presents the thread to sew at the edges of the holes, the slot or notch in the cylinder or cam feeding the thread slot or notch in the cylinder or cam feeding the thread Two levers are coupled together by a square roller to obtain uniform motion for the presser foot frame. A movable plate covers the shuttle in its slide plate. A screw regulates the to and fro motion, its path being limited by a cam.—Patent abandoned.

# APPLICATIONS FOR LETTERS PATENT

Dated April 26, 1869.

1289 R. Sterne, Cork. Improvements in anchors.

1290 S. Oakman, Boston, Suffolk, Massachusetts, U.S.A.

Improvements in the construction of smelting and other furnaces.

furnaces.

1291 G. Hawxhurst and J. Pollock, San Francisco, California, U.S.A. An improved method of, and means for, preventing the corrosion of steam boilers.

1292 W. Prowett, Loman-street, Southwark, Surrey Improvements in knitting machines.

Dated April 27, 1869.

1293 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in locks.

1294 J. P. Cooper, Bow. Middlesex. Improvements in the construction of auts and bolts.

1295 B. Dobson, Bolton. Certain improvements in carding engines.

carding engines.
1296 The Hon. R. Flower and M. Crowly, Durrow,
Queen's County. Improvements in organs.

1297 J. Cane, Kew, Surrey. Improvements in cases or holders for fusees, commonly known as vesuvians, and other lights, and in fusees or pellets to be used therewith. 1298 J. H. Sams, Aberdeen. Improvements in seed sowing machines and horse hoes, and in combined seed drills and horse hoes. 1299 J. Anderson, New-buildings, Londonderry. Improvements in velocipedes. 1300 R. Marshall, Burnley, Lancashire. Improvements in the construction of wheels for carriages. 1301 H. W. Hart, Fitzroy road, Regent's Park. Improvements in the construction of ovens for baking and cooking.

provements in the construction of ovens for basing and cooking.

1302 T. Aspden, Upper Fountain-street, Leeds, and E. H. Lambert, Adelphi-ouildings, Kirkstall-road, Leeds, Improvements in boots and shoes.

1303 J. H. Simpson, Bolton-street, Piccadilly. Improvements in the means, machinery, or apparatus used in the propulsion of trains by currents of air, parts of said improvements being applicable to other purposes where blowing and exhausting or refrigerating apparatus or pulley arrangements are required.

Dated April 28, 1869.

1304 O. Moseley, Bedford-street, Covent-gafden. Improvements in the construction and manufacture of smoking pipes.

ing pipes. 1305 T. A. Haberkorn and B. Rudolph, Berlin, Prussia.

Ing pipes.

1305 T. A. Haberkorn and B. Rudolph, Berlin, Prussia. Improvements in sewing machines.

1306 I. J. J. Lewis, Manchester. Improvements in the ventilation of hats or other coverings for the head.

1307 J. B. Kroll and A. Froment, Boulevard Sebastopol, Paris. Improvements in percolators for infusing tea, coffee, and other similar beverages.

1308 G. Heyes, Radeliffe, Lancashire, and E. Barlow, Little Lever, Lancashire. Improvements in machinery for winding yarns or threads on bobbins.

1309 N. Voice, Handcross, Sussex. Improvements in eask stands or tilts.

1310 H. A. Bonneville, Sackville-street, Piccadilly. A new and improved means of concentrating the caloric of heated water used for bathing purposes.

1311 J. Pim, Finsbury-circus, City. Improvements in apparatus for ventilating apartments, passages, and other places.

apparatus for ventilating apartments, passages, and other places.

1812 L. Isaac, Elysium Villas, Northumberland Park, Tottenham, Middlesex. Improvements in folding or collapsible tables, stands, and stools.

1813 E. Cooper, Laurence Pountney-lane, City. Improvements in ventilating hats.

1814 T. Bostock, Stone, Staffordshire. An improved application or method of applying elastic fabrics in the manufacture of boots and shoes.

1315 B. B. Forbes, Jermyn-street, Middlesex. Improvements in rigging square-rigged vessels.

1316 J. Frolich, Park Villas, Lonsdale-road, Barnes, Surrey. Improvements in apparatus for generating gas to be used in gas furnaces.

1317 A. Meredith, Newgate-street, City, Improvements in the manufacture of iron and steel.

1318 D. Greig, B. Burton, J. Gozney, and T. Atkinson, Leeds. Improvements in apparatus to be used in cultivating land when steam power is employed.

1319 W. E. Gedge, Wellington-street, Strand. Improvements in the construction of pianofortes and other stringed instruments.

1320 H. Bray and H. Adams, Nottingham. Improvements in graining in oil colours.

1321 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in apparatus for generating and condensing steam, and in furnaces for steam generators and for other purposes.

Dated April 29, 1869.

1322 M. Wilkins, St. James-terrace, Paddington, Middlesex, and J. Clark, South-street, Finsbury, City. Improvements in radiating the axles of railway carriages.

1323 R. Griffith, Aberdeen Park road, Highbury Grange, Islington, Middlesex. Improvements in two-wheel velocipedes and other conveyances.

1325 J. G. F. and G. W. Blow, Commercial-street, Middlesex. Improvements in driving bands for ma-

1324 C. ROSC, POSCA, Steam engines.
1325 J. G. F. and G. W. Blow, Commercial-street,
1325 J. G. F. and G. W. Blow, Commercial-street,
Middlesex. Improvements in driving bands for ma-

Middlesex. Improvements in driving bands for Machinery.

1326 E. Crowe, Middlesborough-on-Tees. Improvements in applying the waste heat from reverberatory furnaces to the generation of steam.

Dated April 30, 1869.

1327 R. Elsdon, Brockham, Betchworth, Surrey. Improvements in the construction of kilns for the manufacture of lime and cement, or for the calcining of ores or other material of a like nature requiring to be calcined.

1328 W. Spence, Quality-court, Chancery-lane. Improvements in the manufacture of felt, and in machines for the purpose.

1329 J. Broadfoot, Glasgow. Improvements in lavatories.

1329 J. Broadfoot, Glasgow. Improvements in lavatories.

1330 J. Jamieson, Oldham, and T. Holt, Rochdale. Improvements in the construction of steam engines.

1331 F. Jackson and T. Corbett, Wigan, Lancashire, Improvements in lubricators for steam engines.

1332 F. Bujeaud, Rue du Gond Angouleme, France, Improvements in apparatus for making bottle envelopes.

1333 A. Sleigh, Lancaster-road, Notting Hill, Middlesex. Improvements in the means of, and mechanism for, obtaining motive power.

1334 F. F. Bigot, Paris. A level with mirror.

1335 J. B. Jefferies, Orwell Works, Ipswich, Suffolk, Improvements in horse rakes.

1336 H. J. Seels, Wainfleet Hall, Lincolnshire. Improvements in harrows.

1337 R. Craig, Newbattle Mills, Dalkeith, Mid Lothian. Improvements in machinery for the manufacture of paper.

Improvements in machinery for the manuscutte of paper.

1338 R. Ward, Newcastle-upon-Tyne. An improved oven or apparatus for baking, heating, or drying.

1339 E. Tutte, West-street, Fareham, Hants. Improvements in the construction of hollow walls.

1340 J. Smith, Stanley-terrace, Rathgar, Dublin. An improved method of communication between passengers in railway trains and the persons in charge of such trains.

Dated May 1, 1869.

1341 T. Greenwood, Leeds. Improvements in machinery for cutting joints for boxes, drawers, and other receptacles of wood.

1342 J. Mackie, St. James'-street, Westminster. An improvement or improvement in lock fast breech-loading frearms.

ing firearms.

1343 J. Wilson, Stockport, Chester. An improvement in the construction of bobbins employed in slubbing, rov-

of cotton for spinning.

1344 W. B. Robins, South Molton-street, Middlesex.

Improvements in hand pumps or syringes, and in other pumps suitable to be used for watering flowers, and for other similar purposes. ther similar purposes. 1345 E. and T. Waltham, Stockwell, Surrey. Improve-

the similar purposes.

1345 E. and T. Waltham, Stockwell, Surrey. Improvements in engines to run on common roads.

1346 J. P. Balm, Halifax, and R. Newton, Providence Mill, near Keighley, Yorkshire. Improvements in worsted spinning frames.

1347 J. B. Blake, Victoria Foundry, Alton, Hants. Improvements in the construction of velocipedes.

1348 G. Ritchie, Folkestone, Kent. Improvements in the construction of stop hinges.

1349 W. Broughton, South-street, Finsbury Market, Middlesex, and T. Stevens, Glasgow. Improvements in cooking ranges and other fireplaces, and in apparatus for carrying and turning cooking spits, parts of the said apparatus being also applicable for turning ventilators and other appliances.

1350 J. Conway, Stone Stairs, Broad-street, Ratcliffe, Stepney, Middlesex. The improvement in forge fires.

1351 R. Saunders, Croydon, Surrey. Improvements in cable stoppers and controllers.

Dated May 3, 1869.

1352 C. T. Liernur, Frankfort-on-the-Maine, Prussia. Improvements in the daily inodorous removal, and agricultural utilization, of human excrements, known as Liernur's pneumatic sewerage system.

1353 P. Barry, Lombard-street, City. An improved mode of, and means for, delivering sheets of paper to the feeding apparatus of a printing machine.

1354 J. Shackleton, Bradford, Yorkshire. Improvements in utilizing the exhaust steam from steam engines, and in apparatus for regulating the discharge or flow thereof.

thereof.

1355 S. H. Hodges, Bristol. Improvements in the construction of apparatus for the manufacture of heels for boots and shoes.

1356 H. Williams, Portwood-street, Liverpool. Improvements in velocipedes.

1357 J. B. Nimmo, North Bank-street, Edinburgh Improved lever compensation door and gate spring or closer.

Improved lever compensation door and gate spining or closer.

1358 B. Hunt, Serie-street, Lincoln's Inn. Improvements in spinning hemp, flax, and other fibrous substances, and in apparatus to be employed therefor.

1359 D. P. Wright and C. Butler, Birmingham. Certain improvements in lamps for burning paraffin and other hydrocarbon oils.

1360 F. W. Kaselowsky, Bielefield, Prussia. Improved machinery for separating the woody part from the fibre of flax, hemp, jute, or other fibrous substances of the same nature.

1361 P. Southern, Top Lock, Aspull, near Wigan, Lancashire. Improvements in furnaces.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Go	azette," May 1, 1869
3876 W. R. Lake	8 B. G. George
3877 T. R. Shaw	10 M. Henry
3889 J. Wilkinson	13 A. Batchelar
3910 J. Snape	71 E. Gray
3913 W. Clay	90 B. Hunt
8920 W. G. Reeve	104 J. Schlosser
3921 G. Hookham	118 A. M. Clark
3926 F. P. Warren	131 T. Howeroft
2930 W. H. Walenn	M'Gregor
3931 T. Warren	150 W. R. Lake
3933 W. R. Lake	151 M. Henry
3935 H. Robinson	164 A. M. Clark
3936 R. Boby	193 D. Rivenc
3952 C. D. Abel	194 A. M. Clark
3953 J. A. A. Landa	199 W. R. Lake
3967 T. F. Henley	457 W. H. Taylor
3968 J. H. Johnson	484 E. Round
3977 C. de Bergue	658 T. Howcroft
3980 W. R. Lake	M'Gregor
3986 H. E. Newton	1040 A. V. Newton
3987 W. E. Newton	1085 C. Lungley
4 W. M. Williams	1093 S. F. V. Choat
6 T. Green	1117 J. Kirk
7 T. Green, W. Bur-	1178 G. T. Bousfield
nows and P Towner	1900 H V D Scott

rows, and R. Turner | 1200 H. Y. D. Scott

and A.

rows, and R. Turner | 1200 H. Y. D. Scott
The full titles of the patents in the above list can be
sacertained by referring back to their numbers in the list
of provisional protections previously published.
Opposition can be entered to the granting of a patent to
any of the parties in the above list, who have given notice
of their intention to proceed, within twenty-one days from
the date of the "Gazette" in which the notice appears, by
leaving at the Commissioners' office, particulars in writing
of the objection to the application.

# LIST OF SEALED PATENTS.

	TIDI OF DERL	THE TAXABLE TO
	Sealed Apr	il 30, 1869.
3325	W. E. Bates and T. Dodd	3416 O. G. Abbott 3430 A. M. Clark
<b>335</b> 0	I., W., and J. Holt and J. Maud	3448 R. A. Dalton and G S. Barton
3358	R. Needham	3456 A. J. Deblon
	A. Reid	3579 R. Lakin and W. H
	J. Samuel T. Harrison	Rhodes 3789 J. Hine
	A. M. Clark	143 J. Bourne
3390	A. M. Clark	486 F. H. Collins
3394	N. Wilson	640 W. Clark

Sealed Ma	y 4, 1869.
3355 H. Jewitt	3581 G. Bernhardt
3360 J. Clark	3596 W. R. Lake
3369 T. Lucas and T. P.	3600 F. Holt
Lucas	3648 W. E. Newton
3381 J. C. Haddan	3751 J. Parkins
3383 J. Lewthwaite	3928 A. V. Newton
3386 Sir J. Macneil	38 J. Stevens
3397 R. M'Hardy	327 J. Macintosh
8419 H. Bessemer	455 B. Hunt
3426 G. and J. Wilson	625 W. R. Lake
3446 B. P. Walker	630 B. C. Crawford
3479 P. J. Ravel	718 W. R. Lake
3492 Gerard, Marquis of	722 G. H. T. Finzel
Montrichard	736 C., W., and J. D.
3562 T. Smith and J. V.	794 W. R. Lake
N. Bazalgette	The state of the s

# ing, and other similar machines used in the preparation PATENTS ON WHICH THE STAMP DUTY OF £50

1197 E. Bray and J. C. Hargreaves	1257 S. Bourne 1297 A. Pocheron
1200 D. Thomson	1306 B. Wright
1219 C. D. Fox	1318 G. T. Bousfield
1221 W. Deakin and J. B.	1327 J. A. Jones
Johnson	1333 W. E. Newton
1225 J. Spencer and D.	1345 W. Botwood
M'Corkindale	1397 G. Macdonald
1230 J. Lewis	1404 W. E. Newton
1254 H. A. Manfield	1490 R. and R. Maynard

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1275 J. Oxley 1301 M. Paul 1318 J. Fowler

1461 A. Nicole 1473 C. Attwood

PROVISIONAL PROTECTION FOR SIX MONTHS
Has been granted upon Specifications bearing the following numbers:—

3913	1081	1109	1132	1163	1186	1203	1224
368	1083	1111	1133	1165	1187	1204	1225
471	1085	1113	1135	1167	1188	1206	1226
813	1087	1115	1137	1172	1190	1209	1227
970	1089	1116	1141	1173	1191	1210	1228
996	1091	1117	1147	1174	1192	1211	1229
1065	1095	1119	1149	1176	1195	1212	1230
1067	1097	1121	1151	1177	1197	1214	1231
1069	1099	1123	1153	1179	1198	1215	1234
1071	1101	1125	1155	1180	1199	1217	1236
1073	1103	1127	1157	1181	1200	1220	1242
1075	1104	1129	1160	1182	1201	1222	1244
1077	1105	1131	1161	1184	1202	1223	1246
1079							

#### OF SPECIFICATIONS PUBLISHED LIST For the week ending April 24, 1869.

No.	F	r.	No.	I	r.	No.	P	r.	No.	F	r.	No.	F	r.	No.	P	r.
_	8.	đ.		s.	d.		8.	d.		8.	đ.			d.		8.	d.
2652	0	4	291	0	4	2833	0	4	2947	0	4	2960	0	10	2974	1	0
2680	2	6	292	olo	4	2934	0	10	2948	0	10	2961	0	10	2975	1	0
2878	lā		292		8	2935	0	4	2949	0	4	2962	0	4	2977	0	8
2887	lŏ		292			2936		8	2950	0	8	2963	0	4	2978	1	6
2906	lŏ		292			2937			2951		4	2964	0	10	2979	0	8
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NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office MoneyOrder should be sent, payable to ROBERTSON, BROOMAN, and CO., Patent Department, 166, Fleet-street, London, E.O., to whom all communications upon the subject should be addressed.

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# MECHANICS' MAGAZINE.

LONDON: FRIDAY, MAY 14, 1869.

# APPLICATION OF LIQUID FUEL TO METALLURGY.

THE advantages of liquid fuel, when properly used, over coal for steam purposes have long since been fully demonstrated, and they stand unquestioned. Hitherto, the endeavours to utilize mineral oils have been chiefly confined to the furnaces of boilers; but now we have another eminently successful application of the oil furnace to metallurgical purposes. Our readers can hardly have forgotten the successful trips of the "Retriever," a steam ship of 500 tons burthen, which was fitted up on the system of oil furnace invented by Mr. Dorsett, of 12. London-street, City. This system— 12, London-street, City. This system—which will be found fully described in the which will be found fully described in the numbers of our journal stated at foot\*—consists in burning in the furnace the vapour of creosote, which is produced in an auxiliary boiler. The creosote is, in effect, distilled over, and the products of distillation are burned from jets beneath the steam boiler. Having established the success of the principal in one direction. Mr. Dorsett consisted ciple in one direction, Mr. Dorsett conceived ciple in one direction, Mr. Dorsett conceived the idea of utilizing it in another—that of heating iron plates for bending. The idea was first put into execution about four months since, when Mr. Dorsett obtained permission to apply his system of burning liquid fuel to a plate-bending furnace in Woolwich Dockyard. This was for plates of the ordinary thicknesses used in iron ship-building, and the results were so satisfactory that the authorities directed the principle to be applied to an ordinary plate-bending furnace and to an armour-plate furnace in Chatham Dockyard. It is to the latter of these we wish to direct special attention, as being a great triumph of the Dorsett prin-ciple of burning liquid fuel. On this day week, we were present at some trials with this furnace, which conclusively establish the superiority of the liquid fuel over the coal furnace.

Under ordinary circumstances, the armour-plate bending furnace is lighted from four to five hours before the plate is placed in it. The time occupied in heating the plate for bending depends upon its thickness—one hour per inch of thickness being allowed. Taking, then, a 6-inch plate—as upon the present occasion-we get from ten to eleven hours from the time of starting before the plate is ready for bending. Let us now see what the liquid fuel will do. Upon our visit to Chatham, the cold furnace was lighted, and after an hour was deemed sufficiently heated. A 6-inch armour plate, 7ft. 6in. long by 3ft. wide, was then consigned to the furnace, and after an hour and a-half was drawn out thoroughly heated and ready for bending. Thus, in two hours and a-half we have the work of ten or eleven hours completely and satisfactorily performed. Nor is this all; the advantages of the system do not stop here. The plate was remarkably free from scale, which can only be accounted for by the absence of the deteriorating influence of the products of combustion in the ordinary furnace. Another valuable result arises from this same cause; thinner plates, when heated by liquid fuel and bent double, show no signs of cracking, as they usually do when they have been heated in the coal furnace. This important feature is reckoned to save ten shillings per ton on the metal, which amount it would lose in value by deterioration under the

\* See the MECHANICS' MAGAZINE for October 16 and 30 and November 6, 1868.

The vaordinary method of treatment. porized creosote is supplied to the furnace under notice from the generator by six jets, which are led in through small openings, by which means also just a sufficient quantity of atmospheric air is admitted to support combustion. This method of supplying the heat also offers another advantage; it can be applied to the whole or any portion of the plate. Thus, if a plate requires to be bent at one end only, then the heat is directed to that part. Further, the rate at which the metal is heated can be regulated to a nicety by either increasing or diminishing the num-

by either increasing or diminishing the number of jets. The consumption of oil at Chatham is 108 gallons per furnace per day.

Close beside the armour-plate furnace is another one for heating thinner plates, and which has been regularly at work for some time past. It is heated by four jets, and is supplied from the same generator as the larger one, and which is placed between the On the occasion of our visit some half-inch plates were being heated and bent to various templates. The average time occupied in heating was seven minutes; with the ordinary furnace it takes from twelve to the ordinary furnace it takes from twelve to fifteen minutes for each plate. As already stated, the heating of the 6-inch plate was only experimental and preparatory to a regular course of practical work which is about to commence. But it was an eminently successful experiment, and, moreover, was not the first made in the same furnace. The plate in question had been through the same process three times previously, although its clean, smooth surface would not have led to that supposition, for it had the appearance of having had nothing done to it since it left The future work of the furnace will consist in heating the armour-plates for bending for the "Sultan," a fine vessel of 5,226 tons burthen, now constructing close by the shop in which the Dorsett furnace is In this furnace we have another practical evidence of the value of liquid fuel when utilized in the form of vapour. In its working we have some of the most remarkable and unlooked-for results, which, while they fully satisfy us for the present, only lead us to expect further and even more important improvements in the application of the system. We cannot affect to ignore the labours of others in utilizing liquid fuel; but while giving them every credit for their ingenuity and perseverance, we are bound to regard Mr.
Dorsett as the successful exponent of the
principle. It was he who first demonstrated the practicability of running a vessel of 500 tons burthen by means of liquid fuel, and it was he who has now succeeded in advancing the science of metallurgy in an important degree, in a way which will prove highly beneficial to the iron industries of the world.

# STREET BRIDGES.

THE report of the Registrar-General for 1868 states that 203 persons were killed by horses and vehicles in the streets of London during last year. In a recent week, five lives were lost in the same way, or at the rate of 260 per annum! It needs scarcely be said that this is a state of things that calls loudly for a remedy, if remedy be possible. It certainly demands that the question should be asked and fully considered, and honestly answered—has all been done that may and ought to be done to abate this frightful sacrifice of human life?

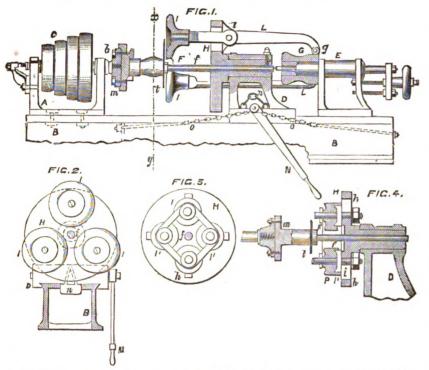
Let us inquire what has been done or attempted, on behalf of foot passengers, to protect their lives and limbs in passing across intersecting thoroughfares. It is well to state

trian who has the courage to make the attempt scarcely demands advocate or protector. But it is only a small proportion of the foot passengers in the streets of London that have the cool nerve, the keen eye, and the sure foot needed to attempt this feat, and those who can accomplish it safely may very well be trusted to get across at St. Paul's Churchyard corners, at the bottom of Ludgate-hill, or wherever else the footpath is continued across the carriage way. Such protection and facilities for moving about London is needed—we venture to think de-manded—on behalf of the aged, the timid, manded—on benair of the aged, the timid, and the infirm, many of whom street crossings almost paralyze with abject terror, as may be witnessed almost at any hour of the day during the busiest time at the crossings to which we have just referred. The palliatives of the danger are—1st. The regulation of the traffic by the police, who discharge their onerous and important duties in this matter in the most admirable manner. The streets would, in fact, be in a constant state of im-passable block for vehicles, horses, and pedestrians, but for the valuable services of the police. 2nd. Next, there is the mitigation of police. 2nd. Next, there is the mitigation of the danger by the provision of "refuges" in the middle of intersecting streets; an expedient attended necessarily by the serious disadvantage of contracting the space for vehicles just at the points where it ought to be widest. 3rd. We suppose the experimental semaphore signal pillar at Westminster may be regarded as an expedient to abate "the perils of the streets." It is doubtful, from what we have seen of the working of the street semaphore, whether it can ever be more than an auxiliary to the living police-men. Practically, the constables continue to be the regulators at the junction of Parlia-ment-street with Bridge-street, and, in so far as the number of men on duty is concerned, the semaphore appears to require an extra man to work it, in addition to the policemen stationed at the corners of the streets.

The only other alternatives that can be adopted to secure absolute safety to foot passengers-and these have been under discussion for many years—are subways or bridges connecting the foot pavements at street cross-To the subways the objections apply that they would require constant watching or would certainly become intolerable nuisances; that they would otherwise be the resort of bad characters, and facilitate the escape of culprits; and that they would require artificial lighting day and night. To the bridges it is objected that they would either involve a heavy cost in the purchase of valuable frontage property for the stairs, or would obstruct the foot walks to the hindrance of those who would not use the bridges; and objections, on æsthetical grounds, have also been urged, that they would disfigure the streets. We venture to think that if street bridges were provided having easy ascents, very many persons would regard them as a great boon, and would gladly use them. We learn that a would regard them as a great boon, and would gladly use them. We learn that a design for iron or steel bridges for street crossings, by Mr. T. Ivison, C.E., is at present under the consideration of the Court of Common Council of the City of London. We are informed that the design has been spoken of in highly commendatory terms by aminent angineers as structurally, abundantly eminent engineers as, structurally, abundantly strong, and, artistically, fitted to prove highly ornamental to the thoroughfares in which the bridges may be erected. It is proposed to have two pairs of stairs at each corner of the intersecting streets. These stairs approach each other by curves, and, joining at the top of the rise, form the end of the bridge way. The bridge ways cross diaintersecting thoroughfares. It is well to state the limitation as to intersecting streets; to cross Cheapside, Fleet-street, Gracechurch-street, or other crowded thoroughfares, during the high tide of vehicular traffic, must, we high tide of vehicular traffic, must, we are constrained to admit, be at the passenger's own risk to a great extent. The pedes-

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#### FORCHASING. MACHINE



allow a continuous stream of passengers to pass in each direction. The width of the pass in each direction. The width of the bridge between the stair landings is calculated and adjusted to the number of passengers that may ascend by the several stairs, and gives room for easy passage, but none for lounging on the bridge, which would of course require to be kept by the police. The clear headway for carriages would be 18ft. The curved form of . Le stairs would obviate an insuperable objection that ladies might otherwise have to using the crossings, and would probably secure for them the decided favour of the ladies, by whom it might be expected they would be freely used.

We venture to think that if the design

before the Court of Common Council may fairly lay claim to the qualities of strength and beauty, that body owes it to the public considering the dangerously crowded character of the street traffic, an evil that is daily on the increase—to test the convenience of these bridges by an experimental structure, say, at the intersection of Gracechurch-street with Fenchurch-street, at one of the corners of St. Paul's Churchyard, at King-street, Cheapside, or at any one of a dozen places that might be named at which there is a constant stream of traffic, and where the span is comparatively narrow, so that the smaller cost would be involved in the experiment.

Since the above was written, we have been informed that the subject has been further considered by the Committee of the Court of Common Council, to which the matter was referred, and that Mr. Ivison has received official instructions to prepare the model of a street bridge, adapted to the crossing at the street bridge, adapted to the crossing at the bottom of Fleet-street and Ludgate-hill, where they intersect Bridge-street and Farringdon-street. The Council and the public will apprehend much more readily the character of the proposed construction from the model than is possible from the drawing.

# MACHINE FOR CHASING AND EMBOSSING METALS.

T is impossible but that a man who, from day to day, is engaged in working the same machine, should be able to detect its weak points, and become conscious, by the unfailing test of actual experience, of its deficiencies. Although it is commonly agreed that when a

fault is known and recognized, it is half amended, yet this does not hold good in mechanical engineering. On the contrary, there is scarcely a single machine that has not several faults, and yet the inventors themselves, and many others, have been for years endeavouring to remedy them without success. To be able to perceive the imperfection of any machine is comparatively a simple, feat to being capable of rendering it more efficient, or, in fact, supplying the essential characteristic in which it may be Numerous as are the continual new wanting. patents taken out for improvements in the details of mechanical appliances, their number would be still greater if every workman who experienced a defect were able to invent a remedy. In the accompanying illustrations is represented a machine for stamping, chasing, and embossing metals, which has been recently patented by M. Grünenburger, of Owing to the special contrivances Nouzon. adopted in its construction, it is capable of performing these operations not only with a greater facility than other similar machines, but effects a saving in the items of labour and manipulation.

The principal feature consists in furnishing the head of the lathe with a mandril, the exterior of which corresponds with the shape of the object to be stamped. In the axis is placed a piece of metal terminated by a kind of plug or buffer, which forces the sheet of metal used in the operation against the end of the mandril. The chasing lathe is shown mounted upon its frame in the longitudinal section in fig. 1, while a cross section, taken through the line x y, is represented in fig. 2. Upon the frame B, which is similar to that of an ordinary lathe, is mounted the puppet A, carrying the cone C. To the frame is also attached the slide D, the puppet E, and the socket G. One end of the shaft or axis of the cone C, has a thread cut on it, to receive a small plate upon which is fixed the mandril plate m. The plate has the same external shape as that required to be given to the metal under operation. The mandril consists of six pieces or more, according to circumstances, which are arranged around a central nave slightly conical in form, and maintained in their places by means of the ring b and an adjusting thumb screw. By loosening the screw, and removing the mandril, with the exception of the central conical part, which in diameter.

is in one piece with the plate, the object can be withdrawn at once.

In the axis of the mandril is placed the buffer F, attached to the rod f, working in the slide D. This buffer compresses the sheet of metal t, between itself and the end of the mandril m, the pressure being exerted by the central rod of the puppet E. The slide D carries the upright H, which is cast with three lugs l, to serve as centres for the levers L, which carry at one extremity the embossing rollers I, which force the metal to take the contours of the mandril when the slide D is put in motion. This movement is effected by manipulating the lever N, to the axis of which is attached the nut n, around which the chains O are placed. By changing the component pieces of the mandril and corresponding socket G, upon which the small roller g moves, any description of metallic chasing or embossing can be performed. In figs. 3 and 4 a modification of the above arrangement is represented, where four rollers I are exhibited. They are adapted for the embossing of cylindrical objects, and the distance between them is regulated by altering the position of their axes i, in their bearings h. They are held firmly in their places by the ring P. If it be required to pierce the objects manufactured with a central hole, the mandril m can be furnished with a point, fitting into a corresponding opening in the buffer F. All objects executed in copper can be successfully treated when cold, but where iron is the metal used, it depends upon the thickness whether it must be heated or not.

# BLACK SEA CABLES.

THE cables to be submerged in the Black
Sea are by this time Sea are by this time completed, and in a few weeks will be on their way to their submarine destination. In order to avoid the mountainous range of the Caucasus, the Indo-European Telegraph Company (the progress of whose works we lately alluded to) determined to lay a cable from the Crimea to a point on the Asiatic shores of the Black Sea, considering that the difficulties of the submarine would be far less than those of the mountainous route, the probability of inter ruption in the former being much less. The orginal cable route was not adhered to, but a shorter route finally settled upon, the length of cable being 100 miles, starting from a point near Djulfa, on the Black Sea, and landing at Suchum Kalé. The second section of cable is that for the Straits of Kertch, a threewire cable of heavy proportions. The insulated core of the Black Sea cable is similar to that of the cables that are generally known -a stranded conductor surrounded by coats of gutta-percha. The insulated conductors in this cable are three, each weighing 273lb. per nautical mile (copper, 107lb. per mile; gutta-percha, 166lb. per mile). It is in the materials specially used for strengthening and preserving the "core" that this cable so essentially differs from all others. Its construction is similar in every respect to some small cables made by Messrs. Siemens Brothers, for the French Government, some few years ago, and laid in the Mediterranean, on the place designed and specially advocated by Mr. C. W. Siemens. The present cable has been manufactured at the works at Charlton. In the ordinary system of cable making, the core is protected with a serving of hemp, and sheathed externally for extra protection, and for strength, with a helical covering of iron wires, the number and size of which depending upon the size of the core and the locality for which the cable is intended. In Siemens' cable, however, the main strength rests in a large serving of best Italian hemp, giving it the character of a rope; this serving is protected (adding, at the same time, some strength to the cable), by a sheathing, laid helically, of strips of flat copper of about  $\frac{3}{4}$ in.



The copper selected is of the best quality, and arrives in the shape of long broad sheets. These sheets are first passed through the shearing machine, where, by means of knives placed above and below, the entire sheet, as it passes through, is divided throughout its breadth into equal narrow strips of the breadth required for sheathing the cable. On coming away from the shearing machine the strips are wound on small bobbins. If a strip of metal or anything be attempted to be wound round a long cylinder, it will in-fallibly bulge up and tend towards the trumpet form, and in order to prevent such a result happening to the copper strip in the cable, it undergoes a process termed "rabitting." Each strip before going to the sheathing machine passes through this operation, which consists in slightly bending its edge and grooving its centre. The bobbins prepared copper are then taken to the closing machine for the final process, but we must first describe the ordinary covering with hemp.

The three insulated wires of the Black Sea cable are served together and wormed, the worming consisting of a number of strands of best Italian hemp. In compound cables some difficulty is experienced (unless special marking be adopted) of knowing one wire from another. In the present cable, Mr. Siemens adopts the simple but excellent plan of passing along with one of the hemp wormings a white tape, which serves as a zero line. After being twisted together and wormed, the core receives its strengthening protection by being served with two servings of best Italian hemp. Each serving consists of about twenty compound strands of hemp, served under tension, and with a very short lay. The second serving is in the reverse direction to the first. After this serving, the cable receives its external protection of copper sheathing, which consists of four strips of the prepared copper, laid helically, one strip overlapping the other for one half its breadth. In consequence of the strip being previously prepared, the cable comes outnice and smooth, and coils most readily, being exceedingly exceedingly and easily managed. The strips of copper are soldered into continuous lengths, care being taken that no two joints be allowed within a certain distance of each other.

In the manufacture of these cables, the whole process goes on at the same time, and really in the same machine. By the application of the same power, the wires are stranded and wormed, served, and finally sheathed in one continuous machine. Usually, these operations are separate and distinct; the core is commonly stranded, wormed, and served in one machine, and afterwards finally sheathed. At Charlton, these several operations are conducted on the same machine (or, rather, combination of machines) at the same time. Where space is an object, this plan is undoubtedly advantageous; but otherwise where there is plenty of room, we cannot but think that time must be lost. Anything required to be done to any one part necessitates a stoppage of the whole. The jointing of the gutta-percha wire, the replacing a hemp bobbin, or the jointing of an external wire, each must stop the whole machine; whereas, in separate machines, only one is

been engaged for the work, and fitted up with the necessary watertight iron tanks, which are three in number. They are placed in the fore and main holds, the forward containing the Kertch cable; the main, the Black Sea (copper sheathed) cable. Over the fore tank, when the cable is in, will be placed a second tank to receive the shows and of the Black Sea cable. The the shore ends of the Black Sea cable. The paying out and picking up machinery, with engines, have been constructed by Messrs. Easton and Amos, and are placed at the stem of the vessel, the paying-out machine being used, if required, for picking up. This ma-chine is so arranged that at any moment it can be stopped and the engine attached to it, in order that the cable may be drawn in to any distance. The engine is supplied with steam either from the main boiler or the donkey. There are some special features of interest relative to the friction brake and the dynamometer, which call for attention, but we regret that want of space compels us to postpone our notice of them to a future occasion.

It is expected that the vessel will leave at the end of this month or the beginning of the next. Mr. C. W. Siemens goes out with the vessel, and will superintend the operations in connection with laying the cable; and we trust that the expedition will meet with all success—completing successfully an important section in the system of the Indo-European Telegraph.

# METEOROLOGICAL RESEARCH BY AID OF THE ELECTRIC TELE-GRAPH.

No. II.

N resuming our consideration of the above subject, subject, we will first notice Captain Maury's opinion, given by letter, dated December 15, 1860, to the British Commission on Lighthouses. The meteorological information which it would be most desirable to transmit to passing ships, as well as to ships in the offing and ports, supposing the telegraph extended to certain lighthouses, would be that relating to the coming storm, and the approach of good weather after it, with the direction of the wind, &c.; and he proceeds

There occurs annually in British waters, and within signal distance of British shores, an amount of shipwreck and disaster that is truly appalling. A single storm has been known to wreck or damage several hundred sail, and to destroy many lives. Now, most of the storms of this class modern research has shown to have their line of march. Taking up this line at one place, one of these storms may, and not unfrequently does, occupy one, two, three, or more days in traversing the region hay, and not unirequently does occupy one, two, three, or more days in traversing the region over which the indefatigable Chief of the Meteorological Department of the Board of Trade has posted his sentinels upon the weather, as his telegraphic ob-whereas, in separate machines, only one is stopped at a time.

The specific gravity of the copper sheathed cable is 1.6; its weight a little over 2 tons; and, although apparently showing but slight signs of strength, its breaking strain is considerably more than would be imagined, amounting to nearly 5 tons. The shore ends are of heavy iron wires, and of the usual construction. The Kertch cable is also an iron covered cable, but the core consists of three wires insulated with Hooper's material. The iron wires are protected externally with a serving of tarred hemp, and the whole weighs about 12 tons to the mile. The steamer "Hull" has

coast of Europe; she is the great commercial centre. All vessels sailing abroad on the Atlantic from any of the continental ports between Ushant and the White Sea pass her offings on the outward voyage and take departure from her cliffs. On the homeward voyage the first landmark is some British lighthouse, headland, or islet. Moreover, those islands, unlike the coasts of any other of the great maritime nations, present in every gale that visits them a lee

Captain Maury further said, in 1861, vide "Nautical Monograms, No. 2," that the electric telegraph placed it in our power "to give warning of the coming storm to the shipping in ports, to the shipping in the offings, to farmers on shore, to travellers, and, in fact, to all who are concerned in a foreknowledge of the weather—and that's everybody."

The practicability of giving forewarning of

great storms to the coasts of the British Isles and of the neighbouring nations having been proved, Admiral Fitzroy thought that the data with which he was daily furnished were sufficient for the purpose of forewarning of subordinate changes of weather, which fore-knowledge expressed merely as an opinion would, he imagined, be useful to the public generally. These opinions, derived from generally. consideration of actual recent observations, he termed forecasts; and in August, 1861, he commenced to send them, with the weather tables, to the newspapers. At the outset, this ambitious experiment was conducted under various tentative arrangements-it would seem, to gain experience—which, however, considerably marred and detracted from their value, because this instability showed a source of weakness, and deprived them of the sustained attention of thoughtful and inquisitive people. It was upwards of two years before they were settled into a consistent method. The evident absence of precision which thus for so long characterized the forecasts no doubt influenced the Board of Trade to appeal to the Royal Society as they did by letter dated February 27, 1863. The Board stated their reluctance

In any way to impede the progress of a system which may prove to be of practical value in saving life and property, but at the same time they wish to be satisfied that the knowledge of the causes and preceding indications of the phenomena of the atmosphere the property of the property sphere has arrived at such a perfection as to render advisable a continued and increased expenditure on weather forecasts for the guidance of the masters of merchant vessels and others carrying on maritime pursuits on the coasts of the United Kingdom.

And their Lordships asked the Royal Society "whether the science of meteorology is now in such a state as to admit of a permanent reliable system of storm signals and daily weather forecasts." The President and Council of the Royal Society, in their reply, dated March 23, 1863, stated:-

With respect to the public importance and the practical success of the superadded branch of the duties of the Meteorological Office, the Board of Trade have opportunities of judging which the Royal Society have not; but the president and council have noticed with great pleasure, in the replies to inquiries circulated by the Board of Trade to the various ports of the kingdom, that three only of the replies are unfavourable, whilst those that are decidedly favourable amount to no less than

In the forewarnings of storms much must, as yet, and onbeddy be viewed as, in a great measure, ten-tative; but there is one class of cases on which such premonitory information is entitled to be regarded as resting on more assured scientific relations. Admiral Fitzroy considers that he has satisfactorily established the occasional occurrence of storms of a cyclonic character of very limited diameter, not much exceeding, perhaps, that of the British much exceeding, perhaps, that of the British Islands themselves, and originating in their vicinity. Islands themselves, and originating in their vicinity. The practice of forewarning is specially suited to such storms. They are characterised by great violence and by frequent and rapid changes in the direction of the wind. The key to their comprehension is supplied by the telegraphic reports which convey to the Central Office a knowledge of the various simultaneous directions of the wind in different localities; and when once comprehended different localities: and when once comprehended they are particularly suited for forewarning, inas-much as, in its general course, the advance of the cyclone is steady in direction and moderate in

With respect to the "forecasts of the state of the

weather" which are published in the newspapers, the president and council learn from Admiral Fitzroy that they really occasion no cost to Government, and scarcely fall, therefore, within the questions submitted for reply; moreover, the president and council have no data whereon to rest a conclusion in regard to the degree of reliance to which these last-named forecasts may be entitled.\*

Under circumstances of much official opposition, the storm warnings and forecasts of weather were suffered to continue. With the seafaring community, the storm warnings continued to gain favour, and much attention was paid to them. Many scientific men never admired the weathercasts; nevertheless, they were much esteemed by the public. They had now been reduced to greater clearness of statement, seemed simple in conception, and exhibited promise of improving into very reliable announcements of the broad features of impending weather from one to two days in advance. Admiral Fitzroy gained unbounded publicity and popularity. He was conscious that he was working out a practical utilization of meteorology unattempted previously on so sound a basis, and he gave unremitting attention to the duties of his post, till at length his constitution and his reason gave way, and he ended life by his own hand on April 30, 1865.

At the lamented death of Admiral Fitzroy, the weathercasts were at once discontinued by the Board of Trade, and they appointed a committee to inquire into the working of the whole system of meteorological telegraphy. The report of this committee condemned the forecasts, and strove to nullify the utility of the storm warnings, which, however, were continued very successfully by Mr. T. H. Babington, the admiral's chief assistant, until December, 1866, when the Board of Trade announced by circular their suspension, be-cause the President and Council of the Royal Society, whom the Board of Trade had consulted upon the subject of the report, were of opinion "that at present these warnings are founded on rules mainly empirical." So earnest, however, were the remonstrances of the public against this step, and so clamorous was the seafaring community for their resumption, that the Board of Trade felt compelled to induce the office, now placed under the management of the Royal Society, to undertake to give the seaports "telegraphic weather information," the euphonious disguise under which they eventually undertook to do what they had in the first instance refused to attempt to do. Accordingly, the storm warnings, in the modified form, were renewed at the beginning of 1868, after they had been in abeyance upwards of a year, and they are still issued on the same conditions. We understand that upwards of 100 places on the coasts receive telegraphic weather intelligence from the Meteorological Office, and hoist the drum signal to indicate the presence of a storm on some part of the United Kingdom, which there is some probability may be felt at the signal station.

It was not to be expected that the collection of scientific meteorological data, by means of the telegraph, could have rendered from the first complete, satisfactory, and reliable practical results. Nevertheless, it is not too much to say that, in the hands of Admiral Fitzroy, no violent storm visited these islands which had not been preceded by the appearance of his warning signals around the coast. The present intimations of approaching atmospheric disturbances are timeous and generally correct, and where timeous and generally correct, and where they are disregarded the consequences are sometimes disastrous. It is, notwithstanding, desirable that an endeavour should be made to deduce from the frequent recurrence of the same phenomena, general laws for the general guidance. This is the true scientific process, in which the Royal Society is engaged at the present time working out. If meteorology is to be of every-day use, weather-wisdom, that

can penetrate into futurity, must be achieved, and though the goal is difficult of attainment all our observations ought to tend to this much-desired end. Something far different is wanted than an accumulation of statical facts and long tabulations. Mathematical knowledge and exactness of instrumental observations are valuable in compiling averages for climatological research; but the practical meteorologist must confine his attention to the facts and figures for the day. This much, at least, is certain, that but for the service of electricity, meteorology would still be unable to give us the benefit of storm warrings, or even our present very limited ability to forecast weather, which is not the least striking illustration of the dependence of the sciences upon each other.

### NOTICES OF BOOKS.

MIE name of Mr. C. P. Sandberg lately THE name of Mr. C. P. Sandberg latery came before the engineering profession in connection with a practical paper on rails and railway materials. That gentleman appears again in the arena of scientific literature as a translator of a valuable treatise on the elasticity, extensibility, and tensile strength of iron and steel.\* The work was written by M. Knut Styffe, director of the Royal Technological Institute of Stockholm, and it of course originally appeared in Swedish. Its translation into our language has been confided to Mr. Sandberg, inspector of railway plant to the Swedish Government. Mr. Sandberg is himself a Swede, and was educated as a metallurgist in Sweden. He has resided many years in England, and has had great experience in all that relates to the manufacture of iron and steel, especially in that of rails and railway materials. In every respect, therefore, Mr. Sandberg was well calculated for the work of translating M. Styffe's treatise, and he has well performed his task. He has further added a useful appendix, in which he describes some experiments on iron exposed to sudden shocks at different temperatures. The results are remarkable, as showing that iron and steel are, if anything, stronger when exposed to severe cold than at ordinary temperatures. The treatise itself has special reference to the tensile strength of iron and steel, including cast iron. There are many problems connected with this question which are yet but imperfectly solved. Amongst those are the relation between tensile strength and composition, previous mechanical treatment and temperature, &c. It is true, that information on these points is to be found scattered through various books and scientific journals. But M. Styffe has devoted years of patient labour in their solution, and the volume before us contains the results of his systematic and invaluable investigations. The work is accompanied by numerous working drawings and tables, which merit careful study. One table is particularly interesting: it shows the relative value of iron and steel side by side. To all who are studying the side by side. To all who are studying the important subject of the properties of iron and steel, as regards their application to useful purposes, we commend Mr. Sandberg's valuable translation of M. Styffe's treatise.

The "Annual of Scientific Discovery" is

The "Annual of Scientific Discovery" is a work which recently reached us from across the Atlantic. It exhibits the most important discoveries and improvements in mechanics, useful arts, natural philosophy, chemistry, &c., &c. It also contains some well-written notes by the Editor, on the progress of science during the year 1868, a list of scientific publications, obituaries of eminent scientific men, &c. Facing the title page is

a fine portrait of Dr. James D. Dana, professor of natural history and geology in Yale Professor Dana is one of the most distinguished mineralogists living, and is equally eminent as a geologist and zoologist. Our readers will perceive that the volume under notice is similar in character to two which are published annually in England. The information is drawn from similar sources—scientific papers and journals. The work is well edited, and the introductory notes give it an additional interest. The sources of information are for the most part acknowledged in the usual way, although there are some instances where this is omitted. Probably, the editor had forgotten to mark on his cuttings the journal from which he clipped them, and will doubtless be more careful in preparing for his next volume.

Mr. John Brook, of Sheffield, has compiled a very useful little book of French measures and English equivalents (J. Robertshaw, Angel-street, Sheffield), which will be found invaluable to merchants, manufacturers, draughtsmen, and working engineers. Mr. Brook has made every calculation separately, and they are very correct, the fractional parts being exceedingly close. The book is arranged most conveniently for ready reference; it can be carried in the waistcoat pocket, and should be in the possession of everyone having anything to do with French measurements.

The Aeronautical Society of Great Britain have just published their third annual report (Hamilton, Paternoster-row). It contains reports of the papers read, and of the discussions thereon, at the various meetings of the Society during the year 1868. It also embodies a report of the Society's first exhibition, which was held last year at the Crystal Palace. Notices of all these matters have appeared in our columns as they occurred, so that it is only necessary here to refer to the little volume as a correct report of the proceedings of the Aeronautical Society, of which every aeronaut—theoretical or practical—should possess a copy.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

TO RENOVATE OLD FILES AND RASPS - THE CHEMISTRY OF THE BLAST FURNACE.

SOME three or four years ago we noticed a method of dressing and renovating old files. We mention the process again, having recently seen a French patent for the same thing. A file or rasp worn smooth is immersed for a time in a mixture of one part nitric acid, three parts oil of vitriol, and seven parts water. The time it must be allowed to remain in this acid bath depends upon the quality of the metal. A very hard steel will require a longer immersion than a soft finegrained metal. Anyone would imagine that the acid, acting equally on all parts, would simply dissolve away some of the metal, and leave the file as smooth and useless as before. But such, we are assured, is not the case. Files may be renovated over and over again, and are always as good as new. Some of our readers may perhaps like to try an experiment, so we describe the treatment to be adopted after immersion in the acid. The tool is first well rinsed in water, and then (to ensure the perfect removal of the acid) in milk of lime. It is afterwards to be dried, and the lime is brushed away. When new files are made by this plan, they require a little additional treatment to protect them while in stock. After they have leen carefully dried, and the lime has been brushed away, they are to be brushed over with a mixture of olive oil and turpentine, and, lastly, well rubbed with very fine charcoal powder.

The chemistry of the blast furnace was very ably treated of by Mr. L. Bell in a lecture to the Chemical Society. The lecturer had made it a subject of special study, and has arrived at some novel conclusions. Readers acquainted with the



<sup>\*</sup> Parliamentary Paper, 218, Session, 1868.

<sup>• &</sup>quot;The Elasticity, Extensibility, and Tensile Strength of Iron and Steel." By KNUT STYFFE. Translated from the Swedish by CHRISTER P. SANDBERG, with a Preface by JOHN PRECT, M.D., F.R.S. London: JOHN MURRAY, Albemarle-street, 1869.

marie-arreet, 1869.

† "Annual of Scientific Discovery or Year Book of Facts in Science and Art for 1869." Edited by Samuel Knes-Land, A.M., M.D. Boston: Gould and Lincoln. London: Trubner and Co. 1869.

matter will remember that Scheerer, Tunner, and Ebelman, who have made experiments on the subject, have laid down with apparent precision the parts of the furnace, and the temperatures at which the different stages of the manufacture of iron—the reduction of the oxide and the union of the iron with carbon—take place. The former commonly supposed to happen at a very considerable temperature, while the latter is commonly believed to take place in the hottest part of the Mr. Bell has arrived at conclusions altofurnace. gether different. His results go to prove that the deoxidation of the ore takes place at a compara-tively low temperature, and that the carburization is effected long before the metal is liquefied and separated from the slag. We shall return to this separated from the slag. We shall return to this part of the subject when Mr. Bell's lecture is published, and now only remark that, as regards the carburization, the experimental results detailed seemed to justify the conclusion that it does really happen in an early stage of the process. The relative economy of the hot and cold blast was discussed at some length, and the question—what is the reason that 2cwt. of coal expended in heating the blast will do the work of Sowt. consumed in the furnace—was disposed of, we think, satisfac-torily; but Mr. Bell is inclined to the belief that, by altering to some extent the construction of the furnace, the cold blast may be made almost as economical as the hot. As regards the quality of the metal produced by the two processes, we seem to have ample assurance that as good metal may be made with the hot as with the cold blast, for, as Sir W. Fairbairn remarks, the uncertain character of hot blast metal appears to be due rather to care-lessness and want of attention in the manufacture than to the use of heated air and defects in the process.

# PARLIAMENTARY NOTES.

MR. LEONARD EDMUNDS, it appears, has succeeded in drawing the attention of the House of Commons to his ase. On Monday evening, Mr. Bentinck asked the Secretary to the Treasury whether a copy of a paper entitled "The History of the Edmunds Scandal, by Leonard Edmunds, was now on record in the Treasury; and, if so, whether he would lay the same upon the table of the House.

Mr. Ayrton said Mr. Edmunds had written a letter to the Lords of the Treasury, enclosing a copy of "The History of the Edmunds Scandal, by Leonard Edmunds," and requesting that it should be placed on record in the Treasury. The Treasury was not exactly a place of record, however, for any one who desired to print about himself, and if Mr. Edmunds wished to have his paper presented to Parliament, he had better find some other channel for it.

Mr. Bentinck then gave notice that on an early day after the Whitsuntide recess, he should call attention to the case of Mr. Edmunds, and make a motion on the subject.

On the same evening, Mr. Candlish asked the President of the Board of Trade whether it was true, as had been stated by the Nantes and Havre Chambers of Commerce, in a recent memorial to the French Government, that in the trade between London and the French ports, the Customs authori-ties in London demanded receipts for pilotage from French vessels, previous to granting clearances, which demand was not made in the case of British vessels engaged in the same trade; and, if so, on what ground such demand was made, and on what grounds the vessels of the two countries were subjected to different treatment.

Mr. Bright said it was true that under the Merchant Shipping Act, foreign ships were obliged to pay customs in London, while British ships were not obliged to pay in the same manner. They were both, however, subject to the same rates of pilotage, and were under the same obligation in regard to the employment of pilots. There was some difficulty in knowing what was the origin of the difference, but it was assumed to be that the owners of foreign ships were often not here, and, therefore, not easily accessible in case the pilotage was not paid; and, also, that it was a better plan for the ewners of foreign ships, as it secured them from the supposed chances of imposition. However, the point would be reconsidered in the amendments to the Merchant Shipping Act, and in all probability the distinction would be removed.

# OUTFALL OF THE HUMBER. BY MR. W. SHELFORD.

T the meeting of the Institution of Civil En-A gineers, April 27, 1869, Mr. C. H. Gregory, President, in the chair, the paper read was on the outfall of the Humber, by Mr. W. Shelford,

The estuary was described as the outlet for the fresh waters from a drainage area of 10,500 square miles, or one-fifth of the whole area of England; but the present paper only treated of the outfall, the observations being arranged under four heads.

1. The facts in connection with the past and present condition of the outfall and of its peculiar feature—Spurn Point. Under this head the disfeature—Spurn Point. Under this nead the dis-trict was said to consist geologically of diluvial clay resting upon chalk, of which the surface was proved to be below the bed of the river at its outfall. The extent of the marshes and the fens adjoining the estuary and their levels were then given, and it was shown that the area of the reclaimed land below high-water spring tides at sea was 290 square miles, while the present area of the estuary at high-water was only 110 square miles. It was also shown that the marsh banks were generally repaired in the thirteenth century. The waste of the Holderness coast, from Bridlington southwards, was stated to average 24 yards per annum, and it was inferred that 1,000 years ago the coast line must have been at least 2,250 yards It was thought possible, that the further east. promontory might then have had a short point, with an ebb channel and a good roadstead close to it, and that here the Danes landed in A.D. 867. Here also gradually rose the town of Ravenser, which was one of the most flourishing ports of the kingdom in the fourteenth century. In 1250, an outlying hamlet of this town, called Ravenser Odd, originated. It was upwards of a mile distant from the mainland, and the access to it was from Ravenser by a sandy road scarcely elevated above the sea. In 1289, the Grimsby people claimed certain privileges there, calling it an island, and probably basing their claims upon its previous insular character. In 1360 Ravenser Odd was totally annihilated by the floods of the Humber and inundations of the great sea. The last mention of Ravenser itself was in 1552.

In 1622, it had been said that "parcel of the Spurnhead, which before did adhere to the continent, was torn therefrom by the sea, and is now in the nature of an island." In 1676, Angell's lights were authorized, in consequence of a broad long sand which had been thrown up at the mouth of the Humber six or seven months before. Smeaton thought that this sand had afterwards become connected with the mainland, and so formed

the Spurn Point of his day.

The author proceeded to state that Sunk Island was spoken of as a novelty in 1667, and was deed as an accumulation of sand and mud, also that Frismersh, or Fresh Marsh, formerly occupied its site, and was destroyed soon after 1362. The leading features of the outfall were then pointed out, as shown by the following charts, of which cartoons were exhibited, viz., Greenville Collin's Chart of 1634, Robert Mitchell's of 1778, Hewett's of 1828, and Calver's of 1852. According to Smeaton, "Spurn Point was a necessary appendage to the cliffs of Holderness, and was in a continual state of travel southward and westward : the southward movement being accompanied by a corresponding encroachment of the river on the Lincoln Coast, and the westward movement by the abrasion of the coast of Holderness by the sea. appeared from these charts that seaward of Spurn a large accumulation of shingle had taken place, and that on the Humber side extensive accretions, including Sunk Island, had formed. Also, that the main flood stream set in to the south of the Bull sand, and the ebb stream set out to the north

The southward movement of Spurn was shown to have varied, and to have been as follows :-

1676 to 1766 . . . 20 yards per annum 1766 , 1771 . . . 56 , , , , 1771 , 1786 . . 10 , , , 1786 , 1851 . . . 4 6 , , , 1851 , 1864 . . 8 7 , , ,

The westward movement was shown by the history of the lighthouses to have averaged 3 yards per annum since 1771. It was also stated that since 1863 an attempt had been made to arrest this movement, and the danger of so doing was pointed out.

2. The ascertained alterations in the tidal regime. Under this head evidence was offered to prove, flower; and numerous that the tidal range of the Humber at Hull mrde in various classes.

increased 3ft. between 1852 and 1828, and 2ft. between 1828 and 1725, making 5ft. since 1725: and if the increase had been continuous since the rise of 4ft., recorded to have taken place about 1357, it would make a total increase of 9ft. in about 600 years. Evidence was also offered, which was considered sufficient to justify the general conclusion, that the tidal capacity of the Humber below low water had increased between 1828 and 1852.

3. The relative value of tidal and fresh water at the outfall. After demonstrating that the discharge of a great flood from the drainage area would only equal a fourth of the tidal capacity, the author expressed the opinion, that whilst there was a wide field open to any one who would undertake the investigation of the phenomena connected with the discharge of so large a volume of fresh water as that which pulsated through the Humber to the sea, yet at the outfall there were other forces at work, of sufficient magnitude to throw into shade the effect produced by occasional freshes acting

directly upon it.

4. The relation of the operations of Nature and of engineering works to the facts recorded. Broadly stating that the tidal action of the estuary had improved, notwithstanding the encroachments upon its tidal area, the author endeavoured to deduce the cause. He considered that in 867 the area at high water must have been much greater and the depth less than at present, that the south flood tide and the north ebb tide would together produce a sand like the Bull sand, which would accumulate till it became an island, but as the flood channel opened, the ebb channel would become weaker, and would be eventually closed by the shingle from the cliffs of Holderness, and that Spurnhead was in this state in 1250, when Ravenser Oud originated. He believed that the consequent contraction of the entrance, combined with the accretions in the Humber and the repairs of the marsh banks, increased the velocity, raised the high water line of the estuary, and depressed the high water level, and that both Ravenser Odd and Freshmarsh were destroyed by the improved tidal action. The destruction of Ravenser itself was attributed to the advance of the sea upon the Holderness coast, and was supposed to have been accompanied by the outflanking of Spurn Point, which had been destroyed by this means. It was pointed out that the Spurnhead was again an island in 1622, and in turn again became a promontory, as the flood channel travelled southwards, and the ebb channel became closed. said that the old action was being repeated at the present time; the Bull sand was the island, but the estuary was now so narrow, and the forces at work in it so great, that it could not rise to the level of low water. It was also said that the sea continued to encroach on Holderness, and would in the present state of things again outflank the Spurn neck.

In conclusion, the author stated that the low water channels up to Hull were now comparatively straight and confined, and the action of the ebo tide was therefore better than ever; but that the channels abreast of Spurn were travelling southwards, and the shingle was still endeavouring to

close the estuary.

# THE ROYAL HORTICULTURAL SOCIETY.

AST Saturday the above society held a show of pot roses and spring flowers at South Kensington, when some choice varieties of roses were exhibited. There were also shown some fine specimens of cut tulips, auriculas, rhododendrons, polyanthuses, lilies of the valley, pansies, Alpine polyanthuses, lines of the validy, pausion, ..., plants, &c., the whole forming an excellent, varied, and highly successful collection. The principal prizes were awarded as follows:—viz., Class 1, and highly successful collection. The principal prizes were awarded as follows:—viz., Class 1, nurserymen, for nine distinct roses: first prize, Mr. W. Paul; second, Mr. C. Turner; third, Messrs. Paul and Son. Class 2, a second prize awarded to Mr. J. James (amateur), for six roses. Class 3, for twelve new roses: first prize to Mr. C. Turner; second prize, Mr. W. Paul. Extra prizes were also awarded to the whole of the above-named exhibitors. Mr. T. S. Ware and Messrs. J. Salter and Sons carried off the first and second prizes for collections of Alpine plants. Messrs. Reeves Brothers were successful in gaining first honours for the lilies of the valley. Messrs. Salter and Sons obtained the second prize under the same head. Messrs. J. Standish and Co. were awarded the first prize from amongst several competitors for their miscellaneous collection of plants in flower; and numerous other minor awards were



# AUXILIARY PROPELLER FOR SAILING SHIPS.

BY MR. JOHN BOURNE, C.E. 

# BOURNE'S AUXILIARY PROPELLER.

A FORTNIGHT since, we described in general terms Mr. Bourne's auxiliary propeller for aiding sailing vessels when overtaken by a calm. This apparatus, it will be remembered, was temporarily fitted on board the "Warwick Castle," on which vessel its efficiency was demonstrated in which vessel its emeterory was demonstrated in dock. Since the experiment recorded by us, a trial has been made in the river, when the ship was leaving for Calcutta. The propeller stemmed the tide for a short time until the wind became too strong, which of course was an exactly oppo-site condition to that under which the services of the apparatus would be required. Hence, no exact results were arrived at, although, what was done was satisfactory, and tallied with our expec-

tations. The apparatus has been removed from the "Warwick Castle"—where it was only rigged up for the purposes of a trial—and, we believe, is to be fitted permanently on another of the "Castle"

to be fitted permanently on another of the "Castle line of ships.

We now give our readers detail particulars, and an engraving of this useful piece of mechanism, from drawings which were kindly placed at our disposal by Mr. Bourne. Our engraving represents a cross section of a vessel fitted with the apparatus. The engine actuates a pinion shaft gearing with a large spur wheel carried by a shaft, with two cranks in it, from which cranks the connecting rods B B proceed to the side of the ship to ing rods BB proceed to the side of the ship to give motion to the oar H, which is carried by the swivelling crane G, which when not in use may be shut up against the sides of the vessel. One of the the centre of which the shank of the car pass

connecting rods which derives its motion from one of the cranks works the car to and from the side of the ship, while the other connecting rod which derives its motion from the other crank works a short handle or tiller connected with the oar. The throw of the two cranks is the same; but one being set a certain distance in advance of the other, it follows that when both are in action a sculling motion is imparted to the oar, one of the cranks impelling the oar and the other feathering it.

The position of the cranks relatively with one another is shown at C. One of the connecting rods is connected to the top of the car at D, and the other to the short feathering arm or tiller E. F is the hinge joint on which the oar reciprocates, and through a short tube or cylindrical socket, in

being supported upon the edge of the socket by a collar formed on the oar to the end that the oar may be feathered by being partly rotated by the feathering arm during the time in which it is reciprocated. The hinge is carried by the crane G. With this useful apparatus fitted on board of ships in the China trade, we shall have an additional and important interest imparted to the annual tea

ON THE BRIDGE OVER THE THAMES CARRYING THE WEST LONDON EX-TENSION RAILWAY.\*

By Mr. LAWFORD, M. INST. C.E.

HIS bridge was erected for the purpose of carrying the West London Extension Railway (which connects the North-Western and Great Western Railways with Victoria Station, at Pimlico), across the River Thames, between Chelsea and Battersea, under the provisions of an Act of Parliament, which received the royal assent on August 13, 1859. The bridge consists of five segmental arches of wrought iron, each arch having a span of 144ft. on the skew, with a rise of 16ft., or 1-9th of the span. There are also, on the Middlesex side of the river, six, and on the Surrey side four, land arches of brickwork. each with a span of 40ft. and a rise of 10ft. The total length, therefore, of the whole structure is 1.270ft. The abutments and piers of the five main openings are massive pieces of masonry, and are carried to a depth of 36ft. below Trinity highwater mark, and 14ft. below the bed of the deepest part of the river. The soffit of the arches at the crown is 22ft. above the same point, i.e., Trinity high-water mark, in accordance with the requirements of the Admiralty and the Conservators of the River Thames. The level of the rails is 26ft. above Trinity high-water mark. The width of above Trinity high-water mark. the river between the two abutments is 776ft. on the skew and 706ft. on the square. The width of waterway afforded is 720ft. The angle at which the bridge crosses the river is 75deg. The greatest depth of water is 22ft. below Trinity greatest depth of water is 22ft. below Trinity high-water mark, the average rise and fall of the tides at this place being about 13ft. 6in.

were constructed in coffer dams, the inner row of piles being 5ft. from the outer edge of the lowest course of masonry, and were driven to a depth of 15ft. below the bed of the river; the outer row were 5ft. from the inner row, and were driven to a depth of only 8ft. from the same point, the space between the two rows of piles being filled with puddled clay. At the conclusion of the work the outer row of piles were drawn, but the inner row of piles were cut off level with the bed of the river. As the masonry of the piers proceeded, the space between them and the piles was puddled clay, well trodden in, to a height of 3ft. above the bed of the river. Each pier stands on a bed of concrete 2ft. thick, extending 3ft, beyond the lowest course of footings. On the concrete is laid a course of York landings. 1ft. thick, and projecting 1ft. beyond the footings.

The foundations are carried up in a brickwork to within 2ft. of the bed of the river, where there is a through course of stone 2ft. thick. From this point to the springing of the arch the pier is faced with picked face ashlar of Bramley Fall stone.
There is a second through course of stone half way between the bed of the river and the springing, and the upper, or last 7ft. of the piers, including the springers (which are 3ft. thick), are entirely solid The two abutments are built similarly to the piers, except that they have hollow chambers, filled with gravel to a height of 8ft. above the springing of the arch; each abutment being just on the edge of the river required only half a cofferdam for its construction. All stone work of both piers and abutments above springing height is tool dressed. The concrete used in this bridge was composed of five parts of gravel to one of blue lias lime, and the mortar of two measures of sharp sand to one of the same sort of lime.

Each of the river arches is composed of six wrought-iron ribs, arranged in pairs, 2ft. 6in. apart from centre to centre. The arch or voussoir of the four main or inside girders is formed of in. vertical plates, 39in. deep at the springing and 24in. deep at the crown, with double angle irons, each 4in. by 31in. by 31in., top and bottom, to which the flanges are attached by means of

\* Abstract of paper read before the Civil and Me-nanical Engineera' Society.

There is also a packing strip 8in. by kin. between the angle iron and the flanges. The flanges consist of two sin. plates, 18in. wide. The upper member of the inside ribs is a horizontal parallel girder, similarly constructed, but only only 24in. deep, throughout its entire length. The vertical web is \( \frac{1}{4} \) in. plate from the pier to the point where the upper and lower member inter-sect, i.e., 15ft. from the centre of the arch, and from this point both vertical webs are gin. in thickness. The bottom flange of the horizontal girder consists of one plate 164in. wide by 1in., two angle irons 3½ in. by 3½ in. by ½ in., and a pack-ing strip 8 in. by ½ in. The upper flange is 15 in. ing strip 8in. by in. The upper flange is 15in. wide, all other dimensions being the same as those of the lower flange; but the top plate is slightly curved inwards towards the rails. In the two outside ribs the voussoir is constructed as already described, but is 30in. deep at the crown and 39in. at the springing. It may be as well to mention here that in these two girders, on the outside faces of the arch, all the rivets, excepting those in the angle irons, are countersunk, no cover plate either being visible at the joints. The whole centre web presents, therefore, the appearance of one smooth unbroken plate. This centre web is a \$in. plate, the two flanges are single \$\frac{1}{2}\$in. plates 16in. wide, the angle irons 3\$\frac{1}{2}\$in. by \$\frac{3}{2}\$in. by \$\frac{1}{2}\$in., and the packing pieces 8in. by \$\frac{1}{2}\$in. The upper member is constructed in the same manner as that of the inside rib, but it has throughout the whole span 4in. vertical plates, and is only 18in. deep at the crown of the arch. The upper flange is 18in. wide, and is parallel with the lower flange is 18in.
wide, and is parallel with the lower flange, which
is only 15in. wide. The angle irons and packing pieces are of the same dimensions as those already described for the inside top members. The total depth of the girders, both inside and outside at the centre of the arch, is the same, viz., 48in.

ing, 80 square inches; in the upper member do., 43 square inches—total, 123 square inches; and at the centre of the arch, where the upper and ower members are together, 105 square inches, the mean average being 114 square inches. These are the full sectional areas, including the rivets. The voussoir and the upper horizontal girder of the four main girders are connected together by a lattice spandrel, composed of H-iron, of three different sizes, viz., 7in., 6in., and 5in. by lin. A stiffening bar of flat iron, gin. thick, is added to each side of the H-iron, connecting the lattice bars throughout at the angles of intersection. In the outside girders the lattice and stiffening bars are all made of double T-iron, riveted together, thus I, and of the same dimensions as the H-iron, i.e., 7in. by 31in., 6in. by 3in., and 5in. by 21in., all Jin. iron. Each pair of ribs is connected pear the haunches by means of frames, composed of angle irons, cross braced and riveted to the ribs. forming an open box girder. This principle is continued to the crown of the arch, where the voussoir and top girder unite in a double cell. Each pair of main girders are braced together at the haunches by means of trellis transverse girders 2ft. 6in. deep, carried up at equi-distant intervals to within 10ft, of the centre of the arch There are seven of these in each half arch; they are composed of angle and bar iron, 31in. by 31in. The top members of the main ribs are secured together by the cross girders, which carry the roadway; the arc fixed over the whole length of the bridge, 4ft, apart from centre to centre, and are composed of a middle web of iron, 10in, deep and in. thick, the bottom of which is flanged with double angle iron, 3½in. by 3¼in. by ¼in., and the top with double channel iron, on the lower flange

The sectional area of each of the four main

girders is as follows:-In the arch at the spring-

brackets riveted on to each of the angles. The are three sets of these tie-rods in each half arch. Upon the end of each arch or voussoir a plate of cast iron, 3in. thick, is fixed, the back of which is planed quite true and even. These, again, fit into heavy cast-iron shoes (weighing 2 tons each), let into the stone skewbacks of the piers and abut-ments, and by means of wrought-iron wedges are finally adjusted in their seats. Contraction and expansion are provided for as follows:—Cast-iron standards are bolted to the stonework of the piers and united by a cast-iron frame, secured with bolts

which the buckle plate flooring rests.

cross girders rest on the lower flange of top main

girder, and are secured in their places by iron

knee-pieces, riveted through the centre webs. The

main or bearing girders are again cross braced by diagonal rods, bolted to a centre plate, and to

them in position, at the same time allow for horizontal motion. A bod and bearing plate, planed perfectly parallel, are fixed under the ends of the girders, upon which they slide.

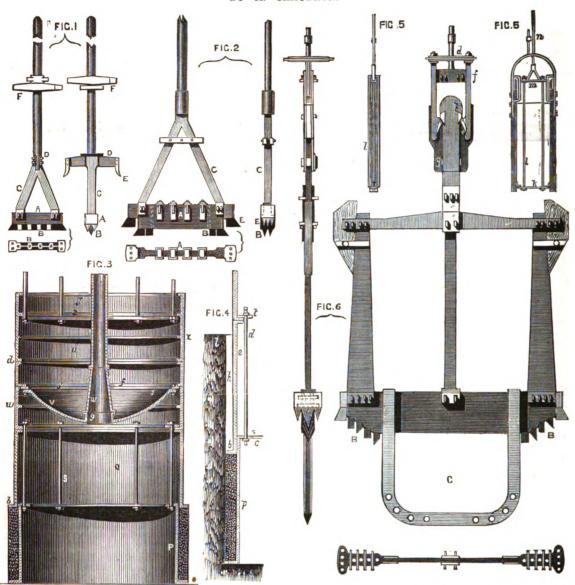
The railway is a double line of mixed gauge, and is carried over the bridge by means of longitudinal timbers with transons every 10ft. ballast is used all over the bridge. A cast-iron moulding is attached to the horizontal girder, throughout its whole length, and a cast-iron plinth is bolted on to the top of the same; an ornamental cast-iron parapet is fixed on the plinth, and the whole is surrounded by a wooden hand rail. The iron of which this bridge is built was manufactured by the Shelton Iron Company, at Stoke-upon-Trent, and is, perhaps, better known as Lord Granville's In the experiments made for testing the quality of the iron, it bore a tensile strain of nearly 18 tons per square inch, without showing any signs of fracture. The H and T-iron used in the signs of fracture. The H and T-iron used in the spandrils was rolled by the Butterley Iron Company. About three-quarters of the ironwork was made and put together by Messrs. Calvert, of York, and, on the collapse of that firm, it was completed by Mr. Charles Lungley, the iron ship-builder of Deptford. The contractor for the work, and, indeed, for the whole of the West London Extension Railway, were Messrs. Brassey and Ogilvie—names well-known in the railway world and a sufficient guarantee that the work would be well and substantially carried out. The width of the bridge between the cast-iron parapets is 30ft. in the clear. The total width of the piers from out to out above springing level is 35ft. 6in., and at that level, including the cut waters, 53ft. 6in. The total cost of the bridge was £104,000, or £82 per lineal foot, and £2 10s. per superficial foot. The materials used in its construction were 2,000 cubic yards of concrete, 11,100 cubic yards of brickwork in mortar, 130,000 cubic yards of brickwork in mortar, 130,000 cubic feet of stone, 2,160 tons of wrought iron, 366 tons of cast iron, 2 tons of lead, and 28,000 cubic feet of timber, exclusive of the piles. This bridge was the joint design of Messrs. Baker and Bertram, the chief engineers of the Great Western and North-Western Railways. It was opened for public traffic on March 2, 1863, since which date some hundreds of trains have passed over it daily, and I am not aware that, up to the present time, any expense whatever (beyond the maintenance of the road) has been incurred, either in repairs or other-The bridge was only 15 months under wise. construction, i.e., from the time the first stone was laid until a locomotive passed over the river. The bridge was very severely tested on January 7, 1863, by Captain Tyler. The narrow gauge load consisted of two locomotives and tenders, funnel to funnel, and two tank engines; total length of train 132ft., total weight 176 tons. The broad gauge 132ft., total weight 176 tons. load consisted of two tank engines, in the same position as the narrow gauge engines, each drawing six loaded coal waggons; total length of train 276ft., total load 292 tons; these two loads, collectively, being equal to about 21 tons per lineal foot. First, the narrow gauge load passed over No. 1 arch at speed, the deflection 5-100ths of a foot. Second, the broad gauge load passed at speed—same result. Third, the broad gauge load on one road and narrow gauge on the other, both passed together over No. 2 arch at speed. On going over No. 1 arch, No. 2 rose 3-100ths of a foot. On going over No. 2 it deflected nearly 10-100ths of a foot, rise and fall 13-100ths of a foot. Fourth, both loads were brought to rest on No. 2 arch, deflection 11-100ths of a foot. When the loads passed slowly over No. 3 arch, No. 2 rose 2-100ths of a foot, rise and fall 13-100ths of a foot. Both loads remained stationary for some time on this arch, but no further deflection took place, and, with the removal of the load, the girders rose simultaneously to their original height. Fifth, the same thing was done on No. 3 arch with a precisely similar result. Sixth, the same experiment was made on the fourth arch, and in exactly the same manner as the fourth experiment-rise of arch 2-100ths of a foot, deflection 10-100ths of a foot, rise and fall 12-100ths of a foot. Seventh, the same thing was done on the fifth arch; the rise was 2-100ths of a foot, deflection 8-100ths of a foot, rise and fall 10-100ths of a foot. The bridge was very steady throughout these experiments, and there was very little lateral vibration, even when both loads passed at the same time in the same direction, either slowly or at speed.

A MEETING of Liebig's Extract of Meat Company and nuts. These standards have recesses to re-was held on Wednesday, and a dividend declared of ceive the ends of the horizontal girders, and secure 6 per cent , together with a bonus of 5a. 6d. per share.

There

# SHAFT-SINKING MACHINERY.

BY M. CHAUDRON.



## CHAUDRON'S SHAFT-SINKING APPARATUS.

THE present method of sinking shafts and tubbing is, when great volumes of water have to be contended with, exceedingly expensive and dangerous for the life of the workmen. arises from the great expense for machinery and fuel necessary for pumping, and from the fact of the workmen having to do their work more or less whilst standing in the water. The danger is proved by serious accidents, arising from the giving way of the tubbing, and from breakages in the pumping machinery, which is suspended above the workmen. Many attempts to sink shafts have had to be abandoned, after enormous sums had been spent in fruitless exertions to master the water. These circumstances induced M. Chaudron, an engineer of mines in Belgium, to bring out his patent system of boring or sinking shafts through aqueous strata, the principal features of which are:—1. An iron tubbing, made by preference of cast-iron rings (cast in one piece), lowered from the surface gradually, and superimposed one above the other as the work proceeds, a complete watertight joint between these rings being obtained by the interposition of a thin layer of lead. 2. The Boite a mousse, or stuffing box, for securing an infallibly watertight junction with the underlying stratum.

By this system the necessity of pumping the water out of such pits or shafts during the progress of the work, is by this system obviated, the apparatus employed being so arranged as to effect the complete isolation of the water-bearing strata, thus enabling the work to be carried on through any depth, at a much less cost, and in a much shorter time, and also with less arduous labour than has

been possible with the means previously employed. By the old process of sinking shafts the workmen had to work in water down in the pit, in a dangerous position, with the pumping machinery sus-pended above them; by the improved system this is entirely obviated, as nearly the whole operation

is performed from the surface of the ground.

For this purpose a boring is first made through the strata, which is effected by means of one or more boring tools, having a number of teeth or chisels which act upon the Chinese system. The tool, after being lifted up by suitable apparatus for a height of about Ift. or 2ft., falling down and crushing the rock. These tools are of a width corresponding with the diameter of the boring to be made, and when the boring is of a large meter, a small central boring is first made with a small tool having a number of chisels all along its under surface, and sometimes also one or more other chisels on the ends of the crossbar fixed higher up on the rod of the tool, which serve to smooth off the side surface of the boring made by the lower chisels. After this, the boring is enlarged by means of one or more larger and heavier tools in succession, having a number of chisels at each end, and a projection in the middle, which passes into the central boring previously formed by the smaller tool, and which serves as a guide. Crossbars acting as guides are also fixed upon the rods of the tools. The boring with the tools of the smaller diameter is, however, always kept so much

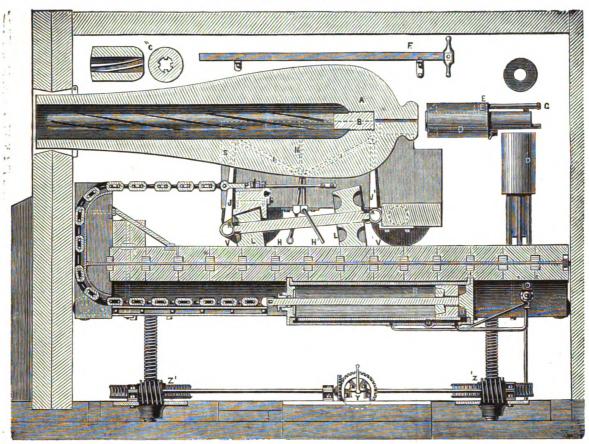
tacle, into which the debris fall, and which is withdrawn when full. Or as the work proceeds, the clearing of the debris may be effected as usual by means of an open metal cylinder, closed at bottom by valves opening inwards, so that by working such cylinder up and down at the bottom of the boring, the debris are made to enter the same, and

are then raised to the surface.

In our engraving, figs. 1, 2, and 6 show various forms of these boring tools. Fig. 1 is a front elevation, a side elevation, and a plan of the under side of the smallest description of tool for making the preliminary boring in semi-hard strata. The bar A, carrying the cutting chisels B, is fixed by keys to the forked end of the rod C, and at a point higher up on the rod is fixed an arm D, at right angles to the bar A, carrying at its ends two other chisels E for smoothing the sides of the boring; F F are guides for keeping the tool in a central position. After the preliminary boring has been made with these tools, it is widened by the use of fig. 2. This tool has chisels B only at the ends, and, in order to keep it central with the preliminary boring, it is provided with a guide G. The preliminary boring is first enlarged by the The preliminary boring is first enlarged by the chisels B, and a further enlargement is effected by the chisels E, situated higher up. Fig. 6 shows a front elevation, side elevation, and and plan of a boring tool, in which the teeth or chisels B are arranged on an incline for the purposes before set forth; the guide, or loop G, being made to fit loosely into the smaller boring made by the preseding test. It this boring smaller diameter is, however, always kept so much in advance of the larger boring, that the debris from the latter shall always fall into the former, and for this purpose the teeth of the enlarging tools are, by preference, arranged on an incline, so as to produce a boring, being connected to the smaller boring by an inverted cone. In the smaller boring may be suspended a metal reception in the purposes before set forth; the guide, or loop G, being made to fit loosely into the smaller boring made by the preceding tool. In this boring suspended a bucket, provided with two or more pawls, which, in catching against the side of the boring, hold the bucket suspended therein so as to receive the debris made by the boring tools. The recovery of broken rods and tools is easily

# THE RODMAN GUN IMPROVED.

BY MR. C. PEMBERTON, R.N.



effected in a way well understood, and presents no novelty.

When the boring through the aqueous strata has been completed, the water from these is effectually cut off from the boring by the following apparatus and mode of operation:—A strong cast-iron cylinder, shown in half sectional elevation at P, fig. 4, is constructed of a somewhat smaller diameter than the boring, having at the bottom an external flange, a, the extreme diameter of which corresponds as nearly as practicable with the diameter of the boring; the upper end of this cylinder fits like a gland into the lower end of a second strong cast-iron cylinder, Q, which has also an external flange, b, equal in diameter to that of the well. The space formed on the external surface of the bottom cylinder, between its lower flange and the flange of the upper cylinder, is filled in with moss or other similar suitable substance, R, which is to act as a packing between the lower cylinder and the side of the well. The lower cylinder, P, is suspended from the upper one, Q, by means of suspension bolts, S, passing through an inner flange, C, formed on the upper end of the former, and through a ring, T, resting upon the flanges, d, formed on the upper cylinders, in such manner, that when the lower cylinder is in place at the bottom of the boring, the upper one is free to slide down upon it, and thus compresses the moss packing, as shown at fig. 4. To the upper cylinder, Q, is now fixed a third cylinder, U, fig. 3, by means of bolts passing through the internal flanges, d, a watertight joint being insured by means of lead packing between the meeting surfaces. To a flange, f, on the interior surface of this third cylinder, is bolted a strong diaphragm, V, of an inverted dished form, so as to withstand considerable pressure from below. In order to facilitate the subsequent removal of this diaphragm, it is made of a somewhat smaller diameter than the cylinders, and bolted to them through a ring, Y. In the centre of this diaphragm is formed an opening g, to which is fixed.

Upon the cylinder U, is now fixed a further one X, also in a watertight manner, and the four thus combined are then lowered by suspension rods Y, fixed in a ring Z, into the boring, until, by the aid of the diaphragm, they float in the water contained therein. Other cylinders are now fixed in succession, in a like watertight manner, to those in the boring, which are, consequently, made to sink

gradually down from the supperadded weight, which sinking is regulated by the suspension rods or chains worked from above, and also by letting in a certain quantity of water above the diaphragm V through the central tube W. This tube also serves to allow clearing implements to be passed down the boring, below the diaphragm, in order to clear out the debris before the cylindrical lining arrives at the bottom. When this has been accomplished, that is to say, when the bottom cylinder has arrived on the seat formed for it, in the impermeable strata below the aqueous strata, the bottom cylinder is pressed by the superincumbent weight down over the gland cylinder P, thus very forcibly compressing the moss packing R, as before described. A watertight packing is thus formed round the lower end of the cylindrical lining, which prevents the water of the upper strata from penetrating into the interior of the lining from below. An annular space h exists between the outer surface of the cylindrical lining and the surface i of the boring, which space is now, by preference, filled in with concrete, as although the moss packing at bottom, and the watertight joints of the lining, prevent the penetration of the water to the interior, yet it is well to guard, by this means, effectually against any leakage that may take place in the lapse of time.

This filling in with concrete may be effected by means of narrow boxes, constructed as shown in sectional front and side elevation at fig. 5, the bottom, K, of which is connected by rods l, to a cover or piston m, attached to a long rod n, worked from above; these boxes are filled with concrete, and are lowered in the annular space, at the bottom k, and piston m. When the cylindrical lining has been made perfectly watertight, and all communication with the aqueous strata cut off, the water is emptied out of the cylinders and the diaphragm removed A strong segmental-ribbed cast-iron curb or sill is then by preference firmly fixed in the boring below the lower end of the gland cylinder P, to connect the two firmly together, so as to provide a firm foundation to the lining. After a perfectly watertight lining has been made to the boring, through the upper strata in the above described manner, the sinking of the shaft or pit may be continued in any desired way, until the strata bearing the mineral or substance to be gained is reached.

sion, in a like watertight manner, to those in the boring, which are, consequently, made to sink ing shafts through aqueous upper strata are—the

complete isolation of such aqueous strata, the great strength of the cast-iron lining, and the possibility of making the joints thereof perfectly watertight; great economy in the expense and duration of the work, considerably less arduous labour for the workmen, and the possibility of passing through all aqueous strata, no matter what their nature and thickness may be. The invention has been well tested, and with great success, at the mines of the "Société de l'Escarpelle," near Donai, Department du Nord, and at the Mines de l'Hopital, in the Department of Moselle, France. It has also been applied with equal success in Prussia and Belgium. This system obtained a Grand Prix Gold Medal at the last Paris Exhibition. We may add that Mr. Henry Simon, of No. 7, St. Peter's-square, Manchester, is the British agent for this invention.

# THE RODMAN GUN IMPROVED.

OUR readers are familiar with the 15-inch Rodman smooth-bore gun at Shoeburyness, which we recently illustrated. In the annexed engraving they will see it as adapted for carrrying rifled projectiles, by Mr. C. Pemberton, of the Royal Navy, whose method of conversion we are about to describe by the aid of our engraving. A shows the gun in section, whilst B is a rifled bar, screwed firmly into the end of the bore of the gun, and grooved to receive a number of spirally-formed ribs, which are cast in the shot to the requisite twist, as shown at C. This method of rifling is, of course, not confined to the Rodman system of guns; it may be applied to other descriptions of artillery, or new guns may be constructed on the principle. This plan of rifling shot is to obviate the destructive method of cutting up the bore of the gun, which nicking process has been proved to reduce the life of large guns 20 per cent. to 50 per cent. It is also clear that this shot of chilled iron is from the greater amount of surface chilled, more homogeneous, harder, and cheaper than the present studded shot, from its being a plain casting.

In loading this gun, a canister, shown at D and D  $^1$ , is employed, into which is fitted an air-tight piston E; on to this is pushed a properly made elastic wad. The canister is then filled with the requisite quantity of powder, on the top of which is placed a cake of powder, previously prepared in

a mould, so as to fit the end of the chamber of the gun. The canister, with its contents, is then put into the muzzle of the gun, and a flexible tube screwed on at G; it is then pushed to the bottom of the gun with the rammer F; air is then forced by an air pump through the tube G, which, acting against the piston E. will force back the canister. leaving behind the whole of the powder with the wad in front ready to receive the shot. By this method of loading, worming and sponging will be unnecessary, flannel bags not being used with the powder, thus economizing time and ensuring safety.

Mr. Pemberton proposes to work the training gear by the old method of side tackle hooked on the eye of catgut rope H H 1, which, when pulled to the right or left by steam or manual power, draws down the rods II 1, and with them the levers JJ 1 and K K, which force down the rollers L L on to the platform, thus taking the weight from the trucks V V 1, and causing the gun to roll in the direction required, to an angle of 40dog. of training right or left. After firing, the gun can be rolled round in its own length 90deg. for the purpose of reloading, with the port closed, by pushing in the pin S, so as to prevent the full action of the foremost lever J and front roller L from touching the platform; the side tackle at H being then pulled, the weight of the gun will rest on the after roller L 1, and two foremost trucks V, and will turn round. After the gun is loaded and again pointed to the porthole, then by pulling on the rope N until the rold J J are above the horizontal line the miles T I are the life of the porthole. zontal line, the rollers LL are thus lifted from the platform, and there they will remain without being secured until again pulled down by either of the side tackles H H, the pin S having been drawn back.

The recoil of the gun is checked by the cylinder R and piston O, connected to the gun carriage at P and piston rod. Air alone, or air and fluid, can be used in the cylinder, and the escape regulated by the cock M, through which the air and fluid is forced during recoil. This apparatus is also used to pull the muzzle of the gun into the porthole, in conjunction with a steam or hydraulic engine, which pumps the fluid and air from one end of the cylinder R and forces it into the other end, thus causing the piston to move in the cylinder, and in so doing draws out the gun to its proper position for training. When the gun requires to be elevated or depressed, the process of muzzle-pivoting can (without interfering with the gunners) be carried on by the men below the platform, or by steam power applied to the intermediate shaft at Y, which would turn four elevating wheels ZZ! thereby raise or lower the gun, platform, and recoil cylinder. The advantages of the muzzle-pivoting gear are, that the operation can be carried on vithout interfering or delaying the time required for loading the gun, the turret or shore buttery will not require to be so high by the distance of method of elevating the muzzle of gun leg. or about 2ft.). There is a saving of (say 18deg. or about 2st.). There is a saving of weight and expense, and the enemy's target is reduced in height.

This system, on a small scale, was fired first in 1865, to test the system of rifling and the recoil cylinder, both of which answered satisfactorily. The length of bore of the gun used was 20in.; diameter of bore, 1.83in.; area of bore reduced by rifled bar, 1.5th in.; spiral uniform, one turn in the length of the bore; weight of shot, 9oz.; length of shot, 11 diameter, foremost end slightly convex, after end rounded, as shown in the engraving; charge of powder, 1 toz; range, 40 yards. tration, two plates of wrought iron fixed 4in. apart, the first §in. thick and the other §in. A much quicker spiral can be attained on this system than with the ordinary method of rifling, the angle of spiral being reduced more than one-half, and the ody of the gun is in no way affected by this mode of rifling.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending May 8, was 2,758. Total number since the opening of the Museum, free daily (May 12, 1858). 1,560,886.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending May 8, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 9,644; Meyrick and other galleries, 1,574; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,201; Meyrick and other galleries, 155; total, 18,674. Average of corresponding week in former years, 12,052. Total from opening of Museum, 8,407,479. INSTITUTION OF CIVIL ENGINEERS.

T the last meeting of the Institution of Civil A Engineers, held May 11, 1869, Mr. C. H. Gregory, President, in the chair, the president stated that during the past week he had visited Paris, accompanied by Messrs. Bidder, McClean, Cubitt, Hemans, and Manby, to present to the Emperor of the French the diploma of honorary member of the Institution of Civil Engineers. His Majesty received the deputation most graciously, and requested that his sincere thanks might be conveyed to the members of the Institution for the honour conferred upon him, and expressed his gratifica-tion at being elected a member of such a body. The cordiality which marked the official reception, and the special and even friendly hospitality which followed it, showed that their illustrious honorary member warmly appreciated the compliment which has been paid to his scientific attainments, and to his enlightened encouragement of public works, and that he desired, through the deputation, as representatives of the Institution, to do honour to the engineers of this country.

At the closing ballot for the session, eleven candidates were balloted for as Associates, and declared to be duly elected, viz.:—Mr. John Henry Abbey, borough surveyor, Huddersfield; Mr. Edward Brotherton Carroll, locomotive superintendent, Bombay, Baroda, and Central India Railway; Mr. James Farrar, engineer to the Bury way; Mr. James Farrar, engineer to the Bury (Lancashire) Improvement Commissioners, &c.; Mr. Frank Garrett, Leiston; Mr. Henry Newson Garrett, Leiston; Mr. James Howard, M.P., Bedford; Mr. Harry Edward Jones, engineer of the Wandsworth Gas Works; Mr. Thomas Miller, Ipswich; Mr. Frederick Peck, Furnival's Inn; Mr. Henry Minchin Simons, Bowling Iron Company; and Mr. James Williams, secretary of the Midland Railway Company.

### IMPURITIES IN WATER.

THERE is a startling difference in the purity of the water supplied to various towns in this dom. The report of Professor Frankland, of kingdom. the Royal College of Chemistry, shows that the water supplied to London, tested by samples drawn in April, ranged from 28.4 tons of solid impurity in the New River water to 42 tons in 100,000 of the supply of the Kent Company. In Bristol, samples drawn in February showed 28.66 tons of solid impurity in 100,000 tons supplied by the Bristol Waterworks Company; and in the supply furnished at All Saint's-lane no less than 127-28 tons. At Manchester, sample taken in June, there were only 6.2 tons of solid impurity; at Lancaster, in November, only 4.58 tons; Preston, in August, 12:44 tons; Newcastle, in September, 23:40 tons; Glasgow, in July, Loch Katrine water, only 3 tons Edinburgh, in September, the Crawley Burn, the Swanston, and the Colinton water, ranging from 11.28 to 14.10 tons; the Coniston water, 22.58 tons; Dublin, the Vartry water, brought from a distance of 30 miles, only 6:34 tons; Cartan's pump water, from the most used of the Dublin wells, 81 62 tons. It will be observed that water is supplied to Lancaster, Manchester, and Glasgow of very much greater purity than any that can be had in London.

#### RICKARD AND PAUL'S AMALGAMATING MACHINE.

T is estimated that the average amount of loss sustained by the different gold and silver mining companies, by the present systems of amalgamation, does not amount to less than 50 per cent. of the assay value in gold ores, and from 30 to 40 per cent. in silver. Taking into consideration that the United States of America is now producing £15,000,000 annually, while Australia furnishes nearly £6,000,000 more, it follows that if the present rate of loss can only be reduced by 10 per cent, the yearly saving of precious metals in these countries alone would amount to £2,100,000. But more than this saving, we are informed, is effected by the machine which forms the subject of the present notice. This apparatus is the invention of Messrs. Rickard and Paul. mining engineers, and is now being brought out by a company having their offices in Great Winchester-street Buildings, City. The first of these machines has been manufactured by Messrs. Gwynne and Co., of Essex-street, Strand, and was recently shipped to Chili. From an inspection of per ton. After half an hour's treatment in the this apparatus we are enabled to give the following machine, a sample of the tailings was taken, which,

particulars. Fig. 1 of our engraving shows a front view, partly in section, and fig. 2, an end view of the machine, which consists of a trough of galvanized iron, about 8ft. long and 4ft. wide, mounted on a timber framing or on brickwork. In the trough is a screw formed of a series of copper plates fitted on a shaft. These plates just dip into the bath of mercury, and keep it continually clean and fit for picking up the particles of gold. The screw is driven by belting, as shown; there is a raising catch and handle for lifting the screw out of the tank. In fig. 2 is shown a jockey beam for taking up the slack of the driving strap when the screw is lifted, a weight being attached to the end of the hanging chain.

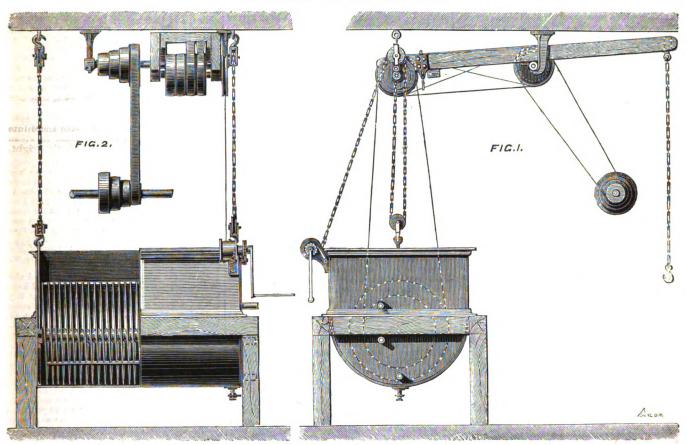
In operating with this machine, the copper plates are first cleaned with a little sand and dilute sulphuric acid. Each plate is washed in elean water as soon as the surface is perfectly bright, and immediately afterwards, the sodiumized mercury—made in the proportion of 1 part of sodium to 1,000 parts of mercury—is applied. As soon as the plates are completely covered with mercury, they are fitted on to the screw flanges and slipped on the axle, so as to form a continuous screw. means of a clamp attached to each plate, and three cross bars of wrought-iron running the entire length at right angles with the blades. cross bars assist also very materially in the agitation of the contents. 50lb. to 100lb. of sodiumized mercury are then introduced into the trough, and the screw lifted in and fitted at about 1-8th or 8-16ths of an inch from the bottom, so that the edge of each screw plate dips about 1-4th of an inch in the mercury. The charge of ore and water is then put in, the ore having been previously ground to such a fineness that it will pass through The screw a sieve of 60 holes to the linear inch. is then put in motion at the rate of from 70 to 100 revolutions per minute, and reversed every two or three minutes, or oftener, if it is found the ore travels too fast from end to end. This backward and forward action of the screw dashes the particles of ore, with violence, first on one side and then on the other of each amalgamated screw plate, which soon becomes coated with gold or silver amalgam, the excess of which flows off and mixes with the fluid mercury at the bottom of the trough or tank. If the contents are heated by steam or by setting the machine over a fire like a boiler, the amalgamation will be accomplished in a much shorter time; although the inventors state that they have had excellent results with cold water—some 86 per cent. assay value of gold in half an hour's working. The addition of 1 or 2 per cent. of salt in gold, and a larger proportion in silver ores, with or without sulphate of copper, is, in addition to application of heat, attended with beneficial results, results, by intensifying the electro-chemical action of the machine.

When the amalgamation is complete, after first drawing off the mercury or elevating the screw, the charge is run off by the plug holes, provided in the side of the tank, one at a time, commencing at the top (the motion of the screw being reduced to allow the mercury to settle), and run into settling vats, or over appliances for concentrating amalgam and sulphides from tailings. The mercury has to be fortified from time to time (every 4, 8, or 12 hours), by the introduction of a little solid sodium amaigam, in poular, 3 parts sodium to 97 parts mercury. The propormercury in the trough. The fluid mercury can be examined by means of the small iron tap at the bottom of the tank from time to time, and drawn off as often as may be considered desirable, when it is strained, distilled, and bullion smelted in the usual manner.

We are informed that from numerous experiments which have been made with this machine in the presence of gentlemen of eminent position in the mining world, it has been proved that the loss has, by its action, been reduced from 50 to less than 20 per cent. in the case of gold ores, while its action has been equally effective with silver slimes (from the Comstock lode, Nevada, United States), which at the present moment are allowed to run to waste in enormous quantities without any effort being made to obtain their precious contents, owing to the defects of the machinery now in use. The following results from an experiment made on January 21 last, illustrate in a very forcible manner the very rapid and effective action of the machine. The ore operated on was from the Chontales Mines, in Nicaragua, and before amalgamation assayed 502. 14dwt. 8gr. of gold

# AND SILVER AMALGAMATING MACHINE.

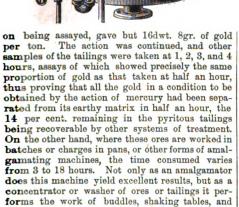
BY MESSRS. RICKARD AND PAUL.



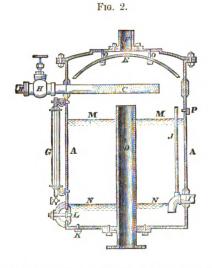
#### FEED-WATER HEATING APPARATUS

BY MR. H. N. WATERS.





other more expensive machinery, in a most rapid and inexpensive manner. The machine has also the advantage of being portable, so that it can be



mules, if necessary, in mountainous countries. These conditions, together with the above results, point out this apparatus as one likely to have a great influence in promoting the commercial success of gold and silver mining enterprise.

# WATER'S FEED-WATER HEATER!

 $\mathbf{A}^{\mathrm{N}}$  important invention, which has been recently patented in Europe and America, has just been submitted to our notice. It is a feed-water heater, the inventor of which is Mr. H. N. Waters, of Hartford, Connecticut, and appears to be one of the most valuable of the recent improvements for economizing fuel and increasing the durability of steam generators. It is applicable to all forms of boilers, and is designed especially for those where non-condensing engines are used. Our engraving shows at fig. 1 an elevation, and at fig. 2 a section taken to pieces and conveyed to its destination, on | of this apparatus. A is the reservoir for the heated

water; B the pipe for bringing water into the heater; C the sprinkler, through which the water is forced in fine jets; D the pipe through which the exhaust steam enters; E is the deflector, which is concave and circular shaped, for holding the steam for an instant in contact with the jets of water from the sprinkler; F is the exhaust pipe through which the surplus steam escapes; G the glass gauge, showing the height of water in the heater; H the valve by which the engineer regu-lates the supply of water for the heater; I the feed pipe, conveying the heated water to the boiler pump; J is an air pipe, connecting with the feed pipe I, for arresting the flow of water to the boiler pump when reduced to the line N, thereby preventing oil, tallow, and all substances retained in the oily scum floating on the top of the water from entering the boiler. K is a plug for inserting a pipe if needed, for carrying off sediment, and for drawing off the water in ease of exposure to freezing; L is a hand hole, for cleaning the heater; M the highest point of water line; N the lowest point to which the boiler pump can reduce the water; O O are bolts by which the deflector is water; O O are bolts by which the deflector is attached to the top of the heater; and P is a plug for the overflow pipe, if required. The exhaust steam from the engine enters through the pipe D, and comes in direct contact with the cold water from the sprinkler, instantly heating it to the boiling point, 212deg. A portion is condensed and forms a part of the supply of water required for the boiler, while the surplus steam passes off dry around the deflector and escapes through the pipe F. pipe F.

This apparatus, although simple in its arrangement, accomplishes a large number of important results. At the time we write it is not in use in England, having only just arrived here from America. In the States, however, it has been adopted in several important works, and is giving excellent results. In Hartford, Conn., we understand that every steam user, except one, has adopted it, the exception being a manufacturer who had applied a costly apparatus just previously to the appearance of Mr. Waters' heater. From its working in America it is stated to have been proved to effect the following results:—It furnishes the boiler with a full and steady supply of thoroughly heated water, raised to the boiling point (212deg.) by means of the exhaust steam, and without producing any back pressure on the engine. It keeps the boiler free from incrustation

and sediment, lime and other impurities in the water being separated from it and retained in the heater, leaving the water soft and pure as it enters the boiler. It is reported to save from ten to twenty-five per cent. of fuel, first, by using exhaust steam for heating the feed water and furnishing the boiler with a regular supply at 212deg.; second, by relieving the engine of the back pressure produced by other heaters; and, third, by purifying the water before it enters the boiler. It saves the boiler by keeping out all sediment, and by preventing the sudden and unequal contraction and expansion of the boiler, which takes place when cold or partially heated water is introduced. It furnishes an invaluable safegard against explosions. A full and constant supply of thoroughly heated feed water enables the engineer to maintain a uniform and proper height of water in the boiler, entirely obviating all necessity for stopping the boiler pump on account of low fire, and removing all temptation to permit the water in the boiler to become reduced to a dangerous point. It increases the capacity of the boiler, by the reason of the water being introduced at the boiling temperature. The condensation of steam which takes place in the heater furnishes an important proportion of the water required for the boiler; hence ensues an economy of water. All oil or tallow used in the cylinder of the engine, and all floating impurities which may be contained in the water, are retained in the heater and prevented from entering the With all these practical advantages, with the fact of its success in the United States before us—as evinced by testimonials from well-known firms there—we can entertain no doubt that it will prove a formidable rival to other systems in use. We hope shortly to be able to report upon the working of one of these heaters; in the meantime, we refer our readers to Mr. Theo. G. Ellis, of No. 62, Dorset-street, Salisbury-square, Fleet-street, to whom we are indebted for our particulars.

### ON THE WISCONSIN METEORITES.\* By Mr. J. L. Smith.

THE following paper is on a new meteoric iron —the Wisconsin meteorites—with some remarks on the Widmannstättian figures, by J.

Lawr nee Smith, Louisville, Kentucky. These meteorites were first brought to my notice by Mr. L. A. Lapham, of Wisconsin, and his attention was called to them by Mr. C. Daffinger, secretary of the German Nat. Hist. Society of Wisconsin. They were discovered in the town of Trenton, Washington county, Wisconsin, and I have called them the "Wisconsin moteorites." Up to the resent time, fragments have been found, indicating present time, fragments have been found, indicating that these meteorites were of the same fall and separated at no great elevation. They were found within a space of ten or twelve square yards, very near the north line of the 40 acre lot of Louis Korb, in latitude 43deg. 22min. N., and longitude \$8deg. 8min. west from Greenwich, and about 30 miles north-west of Milwaukee.

They were so near the surface as to be turned up with the plough; they weigh 60lb., 16lb., 10lb., and 8lb. respectively, and present the usual pitted and irregular surfaces.

The largest of the meteorites, in its extreme dimensions, is 14in. long, 8in. wide, and 4in. thick, weighing 62lb. Its specific gravity is 7.82, and composition-

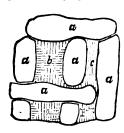
Iron	٠	•		٠		٠		•	•	91.03	
Nickel		•	•		٠		٠		•	6.20	
Cobalt	•	•		•		•		•	•	0.53	
Phosphe		₽.	٠		•		•		. •	0.14	
Copper				•		•		m	in	ute quanti	ty
Insolubl	e r	esidu								0.45	

A polished surface when etched gives wellmarked Widmannstättian figures. There is something, however, peculiar about the markings on this iron, which is doubtless common to other irons, but which has heretofore escaped my ebservation, and I cannot discover, in a hasty investigation, that it has been noticed by others. My attention was called to this peculiarity by Mr. Lapham, on a slice of the meteorite I sent him etched; should these markings be entitled to a separate notice, I propose calling them Laphamite markings. The little drawing accompanying this. which is on a somewhat exaggerated scale, will show what they are.

The Widmannstättian figures are a, bright metallic, with convex ends and sides; b c, of a darker colour, are the other markings, usually smaller and with the sides and ends concave. The

\* "American Journal of Science and Ast."

material of which these dark figures are composed seems to have enveloped the lighter coloured portion, which serves to make the dark lines so beautifully conspicuous. A good pocket glass will show that the darker figures are striated, with lines at right angles to the bounding surfaces. When the figure is nearly square, the lines extend



from each of the four sides, but when much elongated, as at c, they are parallel with the longer sides. Often these lines do not reach the middle of the figure, where only a confused crystallization can be detected. In the interior of the elongated figures, the lines are quite irregular, often running together, and showing a striking resemblance to woody fibre. The nature of these markings may woody nore. The nature of these markings may be easily understood. They indicate the axes of minute columnar crystals, which tend to assume a position at right angles to the surface of cooling. These markings may have been observed by others; and as soon as the subject can be examined on other irons, a better conclusion can be formed.

# INSTITUTE OF BRITISH ARCHITECTS.

THE annual meeting of the Royal Institute of British Architects was held on the 3rd inst., British Architects was held on the 3rd inst., when the council submitted their report, from which we gather with satisfaction that the affairs of the Institute—whether in regard to the steadily increasing numbers of its members, the condition of its funds, or the extent of its operations, continue to prosper. Since the last annual report was issued, 26 associates and 12 fellows (of whom 9 were previously associates) have been elected. It unfortunately became necessary, before the close of 1868, to withdraw the names of 8 defaulters (5 fellows and 3 associates) from the Institute list, which has further been diminished by the death of 6 fellows and 2 associates, and by the retirement from memand 2 associates, and by the retirement from mem-bership of 2 fellows and 2 associates. But even after these material reductions, the present number of fellows is 264, and of associates 244, making a total of 508, or 10 in advance of the previous official year. In other classes of membership the numbers are as follows:—13 honorary fellows, 9 honorary members, and 78 honorary and corresponding members, making, with ordinary fellows and associates, a total of 608 members. There are also 10 contributing visitors, 9 students, and 10 temporary students.

In regard to finance, the balance of funds in hand at the close of 1868 (£86 13s. 6d.) may seem, at first sight, small, as compared with previous years. But it is explained by the circumstance that a large But it is explained by the circumstance that a large number of cheques drawn in 1867 were not presented until January, 1868. The expenses of last year were, moreover, exceptionally heavy. The cost of repairs and fittings alone amounted to £118 11s. 4d. The generosity of the President, which has hitherto enabled the Institute to meet the expenses of the annual conversazione, was last year directed to another object. The President's munificent donation of £500 has been entirely expended in the purchase of books for the library, and the cost of the conversazione was paid out of the ordinary funds. When these circumstances are taken into consideration, it will be seen that the state of finances at the

the City, may be mentioned as an instance in which the timely intervention of this committee has been successful.

The question of artistic education for architects, after a lapse of some years, was again revived at the last annual meeting of 1868. The subject is the last annual meeting of 1868. The subject is still engaging the careful consideration of that committee, and their report is shortly expected. In partial connection with this subject, it should be borne in mind that the council, feeling that the scheme of a voluntary architectural examination had not met, of late years, with the response which was at first anticipated, appointed a committee to reconsider that scheme, and in consequence of its recommendation passed several resolutions, which were submitted to, and adopted by, the special general meeting held on the 5th of April.

A voluntary subscription was opened in 1868 by

meeting held on the 5th of April.

A voluntary subscription was opened in 1868 by the Institute, in aid of the Palestine Exploration Fund. Upwards of £50 was collected for this object, and forwarded to Mr. G. Grove, hon. sec. to the fund. Additional interest will no doubt be felt in this undertaking from the fact that Professor Donaldson, P.P., hon. sec. F. C., has since become officially connected with it, and in the autumn of least year, started for the Holy Land and signed the Donaldson, P.P., non. sec. F. C., has since become officially connected with it, and in the autumn of last year started for the Holy Land and joined the party of exploration. His letter, dated 21st December, 1868, and published in the Institute transactions, has already given some information on this head, and no doubt much more may be expected from the same source. Another letter from that gentleman, dated from Rome, on the 3rd of March, 1868, refers to many important architectural works now being carried on in Italy.

Among the honours conferred at home and abread on members of the Institute, has been that of knichhood by her Majesty on Sir Matthew Digby Wysit. F.S.A., while four other fellows—vix., Professor Donaldson, P.P., hon. sec. For. Cor., Messrs, G. G. Scott, R.A., George E. Street, A.R.A., and A. Waterhouse, have been elected honorary members of the Imperial Academy at Vienna.

In conformity with the order of rotation suggested in the report of council, dated 28th January, 1867, the Royal Gold Medal for 1868-69 has been awarded to "a foreigner, not being an architect," in the progress of Redin, the

awarded to "a foreigner, not being an architect," in the person of Professor Lepsius, of Berlin, the the person of Professor Lepsius, of Derin, the learned author of many treatises on art and archeo-logy, and of the splendid work on Egyptian and Ethiopian antiquities, a copy of which was presented to the Institute by his late Majesty Frederick William of Prussia. The council have satisfaction in finding that their recommendation of Professor Lepsius for this honour has met with the general approval of the Institute, and with the sanction of her Majesty.

# A NEW TRACTION ENGINE.

THE Ames Plough Company are now testing in Worcester, U.S., a combined traction and stationary steam engine, which they have built for some parties on the Parcific coast. It weighs about 18 tons, and as a stationary power may be used for sawing lumber the parties of the parti and as a stationary power may be used for sawing lumber, thrashing grain, pumping, hoisting, hauling, or for any other purpose to which steam power is adapted, as well as to move itself from place to place. The boiler is upright, about 7ft. long and 3 in. dismeter. One end of the bed of the engine is belted to the boiler about midway, and extends rearward about 6ft., and rests upon the axles of the rear wheels. The crank shaft, with a 6-inch crank, is situated across the rear end of the bed. One end of the shaft carries afty and belt, wheel about 4ft, diameter: upon the the rear end of the bed. One end of the shalt carries a fly and belt wheel about 4ft. diameter; upon the other end of the shalt is a pinion which works the traction gearing, which consists of an intermediate between the crank shaft and rear axle. This intermediate shaft carries a gear wheel about 2ft. diameter, driven by the pinion on the crank shaft, and a heavy pinion which drives a gear wheel about 5ft. diameter another object. The President's munificent donation of £500 has been entirely expended in the purchase of books for the library, and the cost of the conversazione was paid out of the ordinary funds. When these circumstances are taken into consideration, it will be seen that the state of finances at the close of 1868 may be reckoned not only satisfactory but even prosperous.

The necessity for a careful examination of the Metropolitan Buildings and Management Bill, suggested at the ordinary general meeting on the 20th January, 1868, led to the appointment of a select committee on the subject, by whom the bill was considered, clause by clause, during many sittings. Their final report was submitted for the approval of a special general meeting held on the 1st of February, 1869, and, after a few amendments, was forwarded to the Metropolitan Board of Works, in accordance with a resolution of the special meeting, and at the request of the Board itself.

The committee for the Conservation of Ancient Monuments and Remains, has, happily, had but few instances of threatened destruction or neglect brought before its notice within the last twelve months. It has, however, tendered its advice on some matters of importance, and generally with a satisfactory result. The preservation of the Church of St. Mary Somerast, in Thames-street, one of the capacity of 2-horse power, or less, will propel 18 tons, or any other weight, from Boston to Cali-



fornia on the common roads, provided it is applied to suitable gearing, and has time enough; and an engine capable of driving one of those huge threshing machines, used by some of the Western farmers, is capable of moving itself and overcoming considerble elevations at a fair pace, on ordinary roads -" F. G. W.," in the "American Railway Times." able

CASTING STEEL UNDER PRESSURE BY USE OF GUNPOWDER.

CASTING steel under high pressure, by means of gunpowder, is thus described by the inventor. It is well known, that cast steel run into moulds is subject to blister, and is otherwise porous, which defect reduces considerably its toughness. In order detect reduces considerably its toughness. In order to give this metal its requisite tenacity, it is subsequently reheated, and then rolled or hammered. A writer in "Van Nostrand's Magazine" says:—As many articles, such as cannon, cannot be treated in this manner, I have devised to submit them to a high pressure, while in a liquid state, inclosed in their same moulds, maintained in iron flasks. For this purpose impediately after wavelengths. high pressure, while in a liquid state, inclosed in their same moulds, maintained in iron flasks. For this purpose, immediately after running a cannon, I cover hermetically the head by a metallic cap, by means of bolts or other devices attached to the flask. This cap is fitted in its centre with a vertical pipe, and provided with a cock at its lower extremity, while its upper extremity is closed by a washer pressed by a bolt, in such a manner, as to act as a safety valve. Before attaching the cap, at, supposing, one inch from the surface of the liquid metal, I introduce in the vertical pipe, and between the cock and the washer, a charge of about one quarter of an ounce of a powder, prepared in the proportions of eighty parts of saltpetre and twenty parts of charcoal. On opening the cock, this powder falls on the metal, ignites and engenders about one-third of a cubic foot of gas at 3,000deg. Fah. These gases exert on the liquid metal a pressure which is transmitted throughout the entire mass, thereby condensing the same and expelling the blisters. The effect thus produced is equivalent to the pressure of a head of liquid metal 90ft, high, admitting that the capacity between the cap and the surface of the metal contains thirty cubic inches. By making the flasks sufficiently sthirty cubic inches. By making the flasks sufficiently strong, the charges of the powder may be varied, so as to produce by its ignition a uniform and general pressure, which is preferable to the partial, irregular, and momentary action of a hammer.

# Tegal Intelligence.

COURT OF COMMON PLEAS.

May 8.
(Sittings in Banco, before Justices Willes, Smith,

and BRETT.)

EDMUNDS v. GREENWOOD AND ANOTHER. thought the notorious "Edmunds Scandal' had been well nigh brought to a peaceful end, as far as the public law courts were concerned, by reference to arbitration. It appears, however, that all is not settled yet to the plaintiff's mind, for on the present occasion Mr. H. Matthews, Q.C., applied on behalf of Mr. Edmunds for a rule to show cause why the rule which had been already granted should not be rescinded upon the ground that it had been drawn up contrary to the inten-tion of Mr. Edmunds, who would be precluded from going into many matters which he deemed

essential to his case. Mr. Justice Willes, after a short discussion, said that, as the Lord Chief Justice was a party to the rule, the learned council might as well attempt to move the Rock of Gibraltar as to get the Court to

interfere without his presence.

Mr. Matthews asked if he should mention the

matter again some other day.

Mr. Justice Willes suggested that as the Lord Chief Justice might not be in Court any more this term, perhaps the better way would be to make an

application to him personally.

Under these circumstances the application was of course not granted.

> ADMIRALTY COURT. May 11. (Before Sir R. Phillimore.)

THE BOECLIFF-JUDGMENT-A NOVEL POINT. THIS case raised a novel question, and which was now decided for the first time. The action was to recover damages for a collision, and before the arrest of the vessel part of the cargo was released. The vessel and the cargo belonged to the same person, and the question was, whether the freight on the whole cargo should not be brought into court and made liable for the collision.

Mr. E. C. Clarkson and Mr. Bayford argued the question, and the judgment was reserved.

His Lordship, in giving judgment, remarked on the novelty of the question, and decided that the whole freight was liable, notwithstanding a part of the cargo had been discharged.
Mr. Clarkson asked for costs.

Mr. Bayford hoped his lordship would not give costs. It was a novel question, and raised for the first time.

Sir R. Phillimore thought it was a case to be argued, and made no order as to costs.

Judgment accordingly.

# Correspondence.

ASSOCIATION OF FOREMEN ENGINEERS. TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR.—Your report of the discussion upon Mr. Rae's paper on "Iron Shipbuilding," at the Association of Foremen Engineers, intimates that I not only disapproved of certain patents, but condemned all patents. Permit me to say that I must have been misunderstood. What I intended to state was, that, in my opinion, every shipbuilder ought to be perfectly free to connect the keel and keelson of a ship with the stem and sternpost if he sees fit; and that the attempt to deprive him of this liberty, except upon the condition of paying a royalty to a patentee, appeared to me preposterous. I also added that, if patent claims were pushed to such extreme lengths as this, all patents, and the patent system itself, would be laid open to objection. Beyond this it was not my intention to go, as I have not yet weighed the advantages and disadvantages of the patent system with sufficient care to form a final judgment either way.—I am, Sir, yours. &c., May 11.

[The report of the proceedings referred to was furnished us by an officer of the Association of Foremen Engineers.—ED. M. M.]

#### TO CORRESPONDENTS.

TO CORRESPONDENTS.

THE MRCHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d., yearly, or 10s. 10d. half-yearly payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Ficet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

ments should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements. ments.

RECEIVED.—C. P. C.—T. S. S.—J. M. E.—R. B.—A. and Co.—B. P.—C. P. and G.—R. N.—G. B.—J. G. W.—H. E. —J. C.—R. T.—F. M.—S. A.—H. J. M.—T. G. E.—J. F.—C. H. G.—A. D.—A. R. and Co.—J. T. B.—M. C.—T. B. S. —H. B.—S. R. S.—J. M. J.—J. A.—G. E. P.—J. B.—H. T. and Co.—C. B.—S. G. Y.—S. and H.—A. R. and Co.—R. F.

# Meetings for the Week.

Tues.—Royal Institution.—Professor Grant on "Astronomy," at 3 p.m.
Thues.—Royal Institution.—Professor Tyndall on "Light," at 3 p.m.
Aeronautical Society of Great Britain.—A Meeting of Members for the Reading and Discussion of Papers, Mr. James Glaisher, F.R.S., will preside, at 8 p.m.
Frl.—Royal Institution.—Professor Jenkin on "The Submersion and Recovery of Submersion

side, at 8 p.m.

La Institution. — Professor Jenkin on "The Submersion and Recovery of Submarine Cables," at 8 p.m.

La Institution — Professor Seeley on "Roman Victor" 24 8 p.m.

SAT.—Royal Institution.—Pr History," at 3 p.m.

# Habal, Military, and Gunnery Items

FIVE heavy 9-inch guns, which, together with the carriage and platform, will weigh about twenty tons each, are being placed in the Hubbertson fort by the men of the Royal Artillery stationed at Pembroke. The work is just completed.

necessary to recommend, the Secretary of State for War has decided that the usual half-yearly exami-nations for admission to the Royal Military College, Sandhurst, subsequently to that in June next, will be suspended until further notice.

The Royal Naval Reserve is becoming, what it should be, a great fact. We understand ("Army and Navy Gazette,") on good authority, that 1,800 men at least have volunteered to proceed on the Whitsuntide cruise, and we hear that the Lords of the Admiralty have been surprised at the enthu-siastic manner in which their invitation has been received and accepted.

THE quantity of shipping for sale in the Port of Liverpeol now amounts to the enormous aggregate of 124,788 tons, thus classified:—Colonial built sailing ships, 39,510 tons; British built ditto, wood, 18,464 tons; ditto iron, 5,266 tons; foreign built, sailing ships, 10,943 tons; new sailing ships, iron and composite, 4,590 tons; screw steamers, 38,180 tons; paddle steamers, 7,835 tons.

THE Board of Trade have awarded a binocular THE Board of Trade nave awarded a binocutar glass to Captain A. Jacques Barbedeau, of the French schooner "Marie Eugenie," of Dalhout, for his services to the survivors of the crew of the barque "Emma," of Liverpool, whom he took from the wreck of their vessel, in the Bay of Biscay, after her "Bistantial The Norwagian barana "Fleatwing." collision with the Norwegian barque "Fleetwing, on March 7, 1869.

The Peninsular and Oriental Steam Navigation The Peninsular and Oriental Steam Navigation Company have announced an accelerated mail communication with Japan. Their steamers will henceforth run fortnightly from Hong Kong to Yokohama and vice versa direct, instead of via Shanghai, as heretofore. The Hong Kong and Shanghai mail service will be continued as at present. The gain by this arrangement will be five days on the homeward passage and two days on the outward passage.

Three days' official trial last week, on board the "Teaser" gunboat, of Mr. Vavasseur's steel 115-pounder gun and carriage, under the direction of Captain Hood, R.N., of the "Excellent," have proved their efficiency. The less weight, by nearly 1½ ton, of the steel gun, would be a great advantage in the armament of vessels of light draft, while the screwshaft compressor is undoubtedly a most valuable appliance for checking recoil, and especially for holding the gun in hand and bringing it up while running out in a seaway. running out in a seaway.

Last month, 21 vessels, of 19,000 tons, were launched on the Clyde, while during the same month in 1868 and 1867 the number of vessels and amount of tonnage launched were respectively 16 and 6,700 tons and 18 and 9,300 tons. The first four months of the year also compare most favourably with the same period in the two preceding years. In that period of 1867 the number of launches was 56, and the tonnage 43,600; in 1868 the number was 61 and 39,600 tons, while during the same period this year the number was 62 and the tonnage 60,400. The finest of the vessels launched last month were the steamship "Aurucania," of 3,000 tons and 600-horse power, built by Elder and Co. for the Pacific Steam Navigation Company; and the steamer "Silesia," 2,690 tons and 600-horse power, built by Messrs. Caird, of Greenock, for the Hamburg and American Company. Besides these, several heavy saling vessels of from 700 to 1,500 tons have been launched during the month. during the month.

MAJOR-GEN. SIR H. WILLOUGHBY ROOKE, C.B., K.C.H., formerly of the 3rd or Scots Fusilier Guards, died on the 2nd inst. at Pilston House, Monmouthdied on the 2nd inst. at Pilston House, Monmouthshire, at the advanced age of 86. The deceased embarked with the 3rd Guards for Holland in August, 1799, and was present in the actions of August 27, September 10 and 19, and October 2 and 6. In 1813 he again embarked with his regiment for Holland, and in command of the 2nd battalion was present at the advance to Antwerp, bombardment of the French fleet at Antwerp, and the attack on Bergen-op-Zoom. Also the campaign of 1815, including the battles of Quatre Bras and Waterloo. In recognition of his military services in the Netherlands he was made a Companion of the Bath, and in 1833 a Knight Commander of the Royal Hanoverian Guelphic Order. On attaining the rank of Major-General in the army, in July, 1830, he retired from the service. retired from the service.

Five heavy 9-inch guns, which, together with the carriage and platform, will weigh about twenty tons each, are being placed in the Hubbertson fort by the men of the Royal Artillery stationed at Pembroke. The work is just completed.

The "Lewiston Journal" reports that Daniel Frederick Bakman, supposed to be the last of the soldiers of the Revolution, died at his residence at Freedom, Cattaragus county, New York, April 5, at the advanced age of 109 years 6 months. Mr. Bakman entered the army just previous to the skirmish of Fort Plains, and took some part in that battle.

In view of the changes in the education of candidates for the army which the Royal Commission, now sitting, on Military Education, may consider it THE current number of the "Proceedings of the



# Miscellanea.

WE would direct the attention of our readers to the great flower show, which will be held in the Crystal Palace to-morrow—Saturday—when there will be attractions of unusual interest both to horticulturists and to the public generally.

MESSRS. WILLS are introducing into this country a granulated tobacco, which is made of various degrees of strength, its chief virtue being that in the process of manufacture all the fine aroma of the leaf is pre-

A NEW electric organ, erected by Messrs. Bryceson Brothers, in St. George's Church, Tuffnell Park, was opened on Saturday last. The quality of tone of many of the stops in this instrument is superb, and the advantages gained from the application of the system are very great.

THE number of Cornish pumping engines reported for March is eighteen. They have consumed 1,851 tons of coal, and lifted 14-3 million tons of water ten fathoms high. The average duty of the whole is, therefore, 52,000,000lb., lifted one foot high, by the consumption of 112lb. of coal.

THE conversazione of the Institution of Civil Engineers will be held at the House of the Institution, in Great George-street, Westminster, on Tuesday evening, the 25th inst. Those of our readers —who have novelties in science or art to bring before the public, will do well to communicate with the Secretary of the Institution without delay.

SOME idea of the severity of the weather in the mountainous districts of Cumberland and Westmoreland may be gathered from the fact that, in spite of the warmth of the sun's rays, these mountains are still covered with snow. The Furness Fells are also pretty generally covered with a coating some two or three inches in thickness.

AGRICULTURAL gatherings in France are becoming Agricultural gamerings in France are occoming as common as they are on this side of the Channel. Last week, a great meeting took place near the old cathedral town of Chartres, where a most important trial of ploughs came off. Upwards of fifty competitors appeared upon the field. The first prize, a gold medal and 200 francs, was carried off by a man sent from England by Messrs. Howard, of Bedford.

Some figures compiled by the Austrian Board of Some figures compiled by the Austrian Board of Trade, show the great increase which has occurred in postal communication, owing to increased facilities and more complete organization. In the year 1866, the number of letters which passed through the post-offices of Austria smounted to 356,906,622 and in 1867, it was 480,549,152, being an increase of over 1981 millions in one was a long 1231 millions in one year alone.

THE highest store rent paid in Broadway is that of E. S. Jaffray's dry-goods store, which bring 60,000 dollars. The highest hotel rent is that of the Fifth Avenue, which rates at 100,000 dollars per annum; but the most profitable of all the edifices on that magnificent street is Trinity Building. This is occupied by offices. It cost about 200,000 dollars, and rents for nearly one-half that sum annually.

WE ("London Scotsman") understand that Mr. James Monteith, of 38, Duke-street, St. James's, has invested with the Senate of the Glasgow University, the sum of £1,000, as a bursary fund, with the view of assisting students in attendance on the University, and encouraging the study of modern languages. The bursaries are to be three in number, each of the annual value of about £16, and tenable for three

THE researches which for five years have been carried on in Yorkshire, chiefly on the Wolds, by the Rev. Canon Greenwell, of Durham, and other archaeologists, are to be resumed this month. This summer the operation will be carried on on the Howardian range and on the moors, on estates of Major Stapylton, Mr. Fairfax, and Earl Feversham. The reassembling of the scientific diggers is looked to with much interest.

THE imports of Australian wool into the United THE imports of Australian wool into the United Kingdom have made a great advance this year, having amounted, to March 31, to 34,546,5161b., as compared with 11,454,298lb. in the corresponding three months of 1868, and 16,856,581lb. in the corresponding three months of 1867. For the whole of 1849, the receipts of Australian wool did not exceed 35,879,171lb., so that the imports are now nearly four times a large as they were twenty were since. times as large as they were twenty years since

THE "Carlsruhe Gazette" relates that an accident the other day befell the celebrated chemist, M. Bunsen. He had prepared a quantity of a com-M. Bunsen. He had prepared a quantity of a composition recently discovered, and had dipped his fingers in the vessel to see if the composition was dry, when that slight pressure sufficed to ignite the whole mass, and a flame arose which scorched the experimentalist rather severely in the hands and face. He is expected, however to recover in the course of ten days or a fortnight.

College Hospital, are at this moment, two under the care of Dr. Harley and Mr. Berkeley Hill, whose cases strongly exemplify the more than usual "severity of spring" this year. The one is suffering from frostbite, producing mortification of the finger; the other, from sunstroke, while playing in the sun on one of the hot days of last week.

The following is a return of the quantity of coal exported from Grimsby during the month of April:

To Belgium, 787 tons; Canada, 433; Denmark, 1,101; Egypt, 1,875; France, 3,694; Holland, 541; Hanseatic Towns, 1,583; Italy, 542; Norway, 160; Prussia, 257; Russia, 1,514; Sweden, 1,511; Spain, 723; Turkey, 819—total foreign, 15,540 tons; corresponding period 1868, 24,585 tons; coastwise, 4.492 tons; ditto 1868, 28,078 tons; decrease, 8,941 tons.

THE College of Surgeons of England, having accepted from Mr. Erasmus Wilson, F.R.S., the munificent sum of £5,000, together with a fine collecs and models, for the endowment of of diseases of the skin, the committee tion of drawings and models a professorship a professors professors of the skin, the committee appointed by the council, will, of Thursday next, present a scheme, which has been agreed upon in concert with Mr. Wilson, for the chair to be thus founded. It is believed that the first series of lectures in connection with this chair will probably be delivered by its founder.

The first two months of this year presented a sensible expansion in the value of our exports to the Australasian group of colonies, the total to February 28 having been £1,835.520, as compared with £1,470,247 in the corresponding period of 1868, and £1,059,426 in the corresponding period of 1867. The exports increased to Western Australia, Victoria, New South Wales, Queensland, and Tasmania; but they decreased as regards South Australia and New Zealand. Of the whole of the exports made to February 28 this year, nearly one-half went to Victoria.

A special ascent of M. Giffard's monter captive balloon took place yesterday, at the Ashburnham Grounds, Chelsea, which Mr. Glaisher attended, with the view of adding to our meteorological knowledge. The wind, however, proved too strong for observa-tions to be taken, and, although, the balloon attained an altitude of about a third of a mile, nothing practical resulted. Another ascent is proposed, and we hope, in our next, to furnish further particulars. In the meantime—having joined in the ascent—we may observe that a more perfect and safe arrangement of captive ballooning was never carried out, and we look forward with much pleasure to our next ascent.

MR. BESSEMER at present receives a royalty of £2 per ton for the use of his patent process, but in February next, we hear, he proposes to reduce the royalty to half-a-crown per ton. Now, as £2 per ton February next, we hear, he proposes to reduce the royalty to half-a-crown per ton. Now, as £2 per ton upon steel rails is equal to about £250 per mile of railway, it is expected that railway companies will be induced to defer all orders, as far as possible, until next spring, when this reduction of £1 17s. 6d. per ton will come into operation. If this should be realized, the summer and autumn will be to the iron-menture an idle energy and many furnaces will promasters an idle season, and many furnaces will pro-bably have to be extinguished. An effort is, however, being made to induce the patentee to avert this threatened dulness of trade, by making arrangements for the proposed reduction to come into force at once. Upon the success of these endeavours will depend in a great measure the prosperity of the iron works in West Cumberland and South Lanca-

THE last sheet of ice which was attached to the The last sheet of ice which was attached to the right bank of the Neva, and which barred the river in front of the Winter Palace at St. Petersburg, broke up on the evening of April 22. The commander of the fortress, followed by a great number of boats belonging to the river police, the Yacht Club, the Custom-house, and the watermen, then crossed the stream to the Imperial residence to announce officially to his Majesty that the navigation was open. The roar of cannon spread the news throughout the city, and the river hitherto so gloomy was suddenly covered with a large number of small craft moving joyously in every direction. Formerly, the commander of the fortress presented to the Emperor commander of the fortress presented to the Emperor on this occasion a cup filled with water from the Neva, and the sovereign, after tasting the liquid, returned the goblet full of pieces of gold. A fixed sum added to the functionary's salary has been substituted for the present.

THE coming exhibitions at Beauvais, which open on June 1, are likely to attract a good many English visitors. The occasion is the agricultural show of the eight northern departments of France, which presents special interest to English farmers and others from the similarity of soil and products with others from the similarity of soil and products with our own country, the beetroot cultivation at the present moment furnishing an interesting object of study. The additional exhibition comprises six groups—the fine arts and application of the liberal arts; furniture, tissues, clothing, &c.; products of extractive industry, raw and manufactured; machinery and processes of the useful arts; agricultural buildings and products; and horticulture. In the dry, when that slight pressure sufficed to ignite the whole mass, and a flame arose which scorched the experimentalist rather severely in the hands and face. He is expected, however to recover in the course of ten days or a fortnight.

The rigours of an English spring are thus referred to in the "British Medical Journal." Among the patients in the new children's ward of University in the hands and expected, however to recover in the course of ten days or a fortnight.

The rigours of an English spring are thus referred to in the "British Medical Journal." Among the patients in the new children's ward of University in the patients in the new children's ward of University in the hands and stript and products; and horticulture. In the centre of the exhibition building will be a large to the worm of the outer edge or edges of the main chair pulley. Patent abandoned.

special gallery is set apart for fine and retrospective art. Steam and water power are provided for ma-chinery in motion. One new feature deserves notice; the chief prizes will consist of works of art, one in each group, and the others of medals.

THE broad gauge, as regards the midland districts of England, is now a thing of the past, the Great Western Railway Company having ceased to run any broad gauge passenger trains between London and Birmingham or Wolverhampton. Travellers be-tween London and Shrewsbury or the North have no longer to change carriages either at Wolverhamp-ton or Birmingham, the trains now running through between Paddington and Birkenhead on the narrow gauge without any change whatever. Already, too, on the branch between Reading and Basingstoke, the on the branch between removed, thus converting that third rail has been removed, thus converting that line from a mixed gauge into an entirely narrow gauge line, and connecting the Great Western system with the London and South-Western Railway and the south of England. In addition to this, the whole of the broad gauge lines north of Oxford will immediately be taken up, removing in the midland counties the last trace of the system of one of the two great rival engineers, whose plans were so long hotly contested, and celebrated as "the battle of the gauges."

# Patents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—3265, 3285, 3292, 3297, 3307 BUILDINGS AND BUILDING MATERIALS—3279, 3288, 3291,

CHEMISTRY AND PHOTOGRAPHY-3313, 3315

CHEMISTRY AND PHOTOGRAPHY—3313, 3315
CULTIVATION OF THE SOIL, including agricultural implements and machines.—3312
ELECTRICAL APPARATUS—3272, 3283
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—3267, 3276, 3277, 3280, 3303, 3306, 3310, 3311
FOOD AND PRIVE LAWS including the apparatus for pre-

3311
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—3281, 3294
FURNITURE AND APPAREL, including household utensils time-keepers, jewellery, musical instruments, &c.—3274, 3295, 3299, 3301, 3304, 3308
GENERAL MACHINERY—3264, 3266, 3305
LIGHTING, HEATING, AND VENTILATING—3270, 3273, 3278, 3287
MELAIS a toolyding

3282, 3287
MBIALS, including apparatus for their manufacture—
3268, 3298, 3313, 3318
MISCELLANEOUS—3269, 3275, 3284, 3289, 3302, 3309, 3314
ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—3290, 3293, 3296
SHIPS AND BOATS, including their fittings—None.
STRAM ENGINES—3271, 3300
WARFARE—3266

3264 E. A. RIPPINGILLE, Holborn-hill, W.C. Motive over. Dated October 24, 1868.

This relates, first, to novel combinations and arrangements

This relates, first, to novel combinations and arrangements of parts whereby the products of combustion, in addition to being employed to raise steam, are ultimately mixed with such steam, and employed in any suitable manner to obtain motive power. The direct products of combustion are caused to enter a chamber, forming part of or in close connection with a chamber, in which a number of plates and troughs are arranged in such manner that water, which is allowed to enter at the top of such chamber in suitable quantities, is caused to fall on to the uppermost plate or rough, from which it drops into the troughs or plates immediately below, and when such trough or troughs are filled with water, the water begins to fall on to the plate next below, and thence into the next trough, and so on, until it arrives at the lowermost troughs, whence it is allowed to fall through suitable overflow channels to the bottom of the chamber.—Patent abandoned. of the chamber.-Patent abandoned.

of the chamber.—Patent abandoned.

3265 J. SILVESTER, West Bromwich. Steam gauges
Dated October 24, 1868.

This relates to pressure or steam gauges, in which the
pressure is measured by means of a flat tube, closed
at both ends, and bent into a circular or nearly
circular figure. An arm is used of such a length that
when the tube is in its normal position they overlap
each other. A screw pin, constituting the axis of the
index finger, passes through the bush of the said finger,
and takes into one of the arms. On the under side of the
said bush is a slot in the direction of a radius from the
centre, on which the index finger turns, and in this slot a
pin on the end of the other arm engages.—Patent abandoned.

3266 W. DAWES, Leeds. Pulley block. Dated October 24,

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2267 P. M. CRANE, Manchester. Sizeing cotton warps.

Dated October 24, 1868.

This consists in the employment of paraffin as a constituent in the formation of sizeing and dressing compounds for cotton materials, which substance may be added to any of the usual sizeing compounds; for example, a compound such as follows answers well:—Flour 2801b. (or I sack), tallow 1lb., paraffin from \( \frac{1}{2} \) per cent. to 2 per cent. of the flour employed.—Patent completed.

3268 W. HEASLER, Greenwich. Coating wire. Dated

3268 W. Heasler, Greenwich. Coating wire. Dated October 24, 1863.

Upon each end of a shaft, extending the whole length of the machine, toothed wheels are keyed, each being of the same size. The shaft on which these wheels are keyed carries a pulley, round which a band passes, driven from any prime mover, whereby rotary motion is communicated to the shaft, or it may be driven by hand. The toothed wheel on the further end of the shaft is in gear with another but smaller wheel on a shaft, revolving in and supported by a standard, and carrying a frame supporting a drum, round which the wire to be coated is wound. The other end of this frame is connected to a hollow shaft, through which the wire, after being first carried over a guide pulley, is led, the hollow shaft being supported by and revolving in a standard.—Patent abandoned.

3269 B. NICHOLL. Regent-street. Plastic composition. Dated October 26, 1868.

This consists in a species of scagliola, composed of chalk, ordinary cement, and, if desired, colouring matter, by preference mineral colours, according to taste. It has been found that 100 parts by weight of chalk to 50 parts of cement will give a good result, but the inventor does not confine or restrict himself to these precise proportions. This is to be mixed with water to the consistency of plaster, and spread out in the form of a sheet or thin layer to dry and harden. When thoroughly dried, the composition is to be broken up into fragments of irregular form and size, according to the effect to be produced. These fragments are subsequently mixed with a semifuld or plastic mixture of ordinary cement and chalk, which latter substance may be tinted as required by the addition thereto of any suitable colouring matter.—Patent completed.

completed.

3270 C. HARRISON and R. WILSON, Manchester. Indicating temperature. Dated October 26, 1863.

This consists in the use and application of a thermometer and spirit level, mounted parallel to one another, upon one arm of a balanced lever, working on pivots in the same manner as a scale beam, the other arm of such lever being geared to, or in connection with a simple or compound lever, which implings against the clapper of a bell, hereinafter described. This bell is actuated by a train of wheel or clock work, the moving power of which may be a weight or spring, but the clapper of such bell is prevented moving so long as the lever impinges against it.—Patent abandoned.

11.—Patent abandoned.

3271 J. Loader and W. H. Child, Finsbury. Rotary engines. Dated October 26, 1863.

A central shaft in a fixed cylinder has a crank throw, and the crank pin has a disc fitted thereon. This disc revolves against the inside of the cylinder. A radial or other piston or stop works through a slot in the cylinder, its face works through a stuffing box, and its inside edge is kept against the revolving disc by a spring or otherwise. The movement of the disc is epicycloidal.—Patent abandoned.

doned.

3272 W. A. LYTTLE, General Post Office, London. Electro-letegraphic instruments. Dated October 26, 1863.

The inventor arranges a straight row of lever keys to represent the letters of the alphabet or other desired signs, and he places a drum or cylinder in such a position that when the keys are depressed their ends shall touch or approach the surface of the cylinder in the same longitudinal line. This cylinder is fitted with the same number of projecting pins as there are keys, and the pins are distributed spirally from one end of the cylinder to the other. so that lines drawn parallel to the axis through each pin should divide the surface of the cylinder into as many equal longitudinal parts as there are keys.—Patent abandoned.

doned.

3273 W. E. Gede, Wellington-street, W.C. Gas burner.
(A communication). Dated October 26, 1868.

This consists in its receiving gas through the middle and air from beneath or at the sides, with the object of altogether doing away with the branches and the solderings or brazings. Especially if the largest possible holes or circular outlets, more or less broad, may be pierced in the burner, according to the degree of light required.—Patent completed.

eompleted.

3274 W. BOULTON, Burslem. Pottery. Dated October 26, 1868.

This consists in giving an eccentric or irregular motion to articles made by the jigger or whirler, which may be performed or carried into practical effect in the following manner:—Two oval or irregular pulleys or cams are fixed on the jigger or whirler spindle, the same to be brought in contact with a round or friction pulley, by a spring or balance weight, the carrier of the said round pulley being stationary; the neck and toe blocks of the jigger spindle being made to slide, give a motion to the spindle, according to the shape of the pulley on the said spindle.—Patent completed. completed.

3275 J. JONES and S. P. BIDDER, Mitcham. Breaking

3275 J. JONES and S. P. BIDDER, MICCIAM. Breaking mineral. Dated October 26, 1863.

This consists in effecting the breaking down of coal, stone, and other minerals, by means of either hydraulic power or by screw power combined with a wedging action, in place of effecting such operation by blasting, as is at present the case.—Patent abandoned.

present the case.—Patent abandoned.

3276 T. Speight and H. France, Bradford. Wool combing. Dated October 26, 1868.

This consists in dispensing with the interior comb or combs, and substituting in lieu thereof one or more barrel porcupine combs, or endless card, or pin belts, to work in conjunction with the said large comb, for cleaning the projecting ends of wool or other fibres fed thereto.—Patent completed.

3277 T.PREISTLEY and W. DEIGHTON, Bradford. Looms.
Dated October 26, 1868.
This relates to the picking motion, or the means of picking the shuttles in plain looms for weaving, and the patentees' object is to dispense with the picker spindles

now employed. A slot hole is formed in the bottom of each shuttle box, and the shank of the picker is formed to slide freely in the slot, with a T-head or projection under the box, to prevent the picker coming out of the slot when the loom is in action. Ordinary upright picking sticks are employed, which are hinged in line with the axis of the lay or lathe swords, and have them to project upward through the slots of the boxes, and also through slots formed in the pickers. Motion or action is given to the picking sticks by horizontal shafts, actuated by tappets, fixed on the low shaft of the loom, the said shafts having levers thereon connected by adjustable metallic rods or links suitably jointed, to allow the required duplex motion of the said picking sticks.—Patent completed.

3278 W. MORT. Fenchurch-street. Retricerating. (A

motion of the said picking sticks.—Patent completed.

3278 W. MORT. Fenchurch-street. Refrigerating. (A communication). Dated October 26, 1868.

This consists in an improved mechanical combination for obtaining cold by an application of the well-known natural law, that a reduction of volume of any permanent gas, and simultaneous removal of the sensible heat, caused thereby, results upon expansion in a capacity for a power of taking heat from the bodies with which it comes in contact. In the case of articles of food, they are placed in a thin metallic cylinder (metal being a good conductor), the metallic and the wooden cylinders being separated by a spiral or spirals, made of wood of sufficient thickness to form the ribs of two cylinders, great strength in which is ensured by bolting the two together through the wooden spirals. The gases are expanded in file space between the spirals, whereby the reduction of the temperature is accomplished, and after circulation are led back to the apparatus for recompression.—Patent completed.

3279 F. RANSOME, Queen-street Place, E.C. Preserving

apparatus for recompression.—Patent completed.

3279 F. RANSOME, Queen-street Place, E.C. Preserving stone. Dated October 26, 1868.

This consists, first, in applying in succession to the stone or other material to be treated a solution or fluid mixture of lime or baryta or other similar substance, and a solution of silica, by preference an alkali silicate. Second, in applying in succession a solution of superphosphate of lime and a solution of baryta, strontia, or lime, by preference, and alkali silicate.—Patent completed.

3280 A. M. CLARK, Chancery-lane. Scouring wool. (A ommunication). Dated October 26, 1868.

3280 A. M. CLARK, Chancery-lane. Scouring wool. (A communication). Dated October 26, 1868.

This relates to machinery for removing the grease from wool with the aid of plaster in powder. Cast iron or other frames are placed about 4ft apart. Drums or cylinders of about 3ft in length are each formed of half cylinders riveted together. Each drum is provided with sliding inlet and outlet ports, the outlet port being opened by the aid of racks adapted to the curve of the cylinders. The pinions have teeth on a fifth only of the circumference, for the purpose of raising the ports by the aid of racks, and allowing them again to fall when released from the teeth.—Patent completed.

3281 W. E. Gedge, Wellington-street, W.C. Manufacture of sall stones. (A communication). Dated October 27, 1868.

ture of salt stones. (A communication). Dated October 27, 1868.

The mode of manufacturing these "salignons," or salt stones or cakes, is as follows:—The crystals of sal gemma, a mineral salt, are first broken or powdered into pieces small enough to pass between two cylinders, which reduce them to powder. A certain quantity of water is then mixed with this pulverized salt, and it is put into wooden moulds, in which, by means of a powerful pressure, all the molecules are reunited. The drying then takes place, and by the rapid evaporation of the water, the salt crystallizes, and thus regains nearly all the hardness it possessed before the operation. The mode of using these salignons, or salt cakes, is as follows:—A small wooden box is made, into which the salt stone fits tightly, or is otherwise secured. This box is then nailed or screwed between the rack and the manger, giving it a horizontal position for horned beasts, and a vertical one for horses, as being that in which these animals may most readily lick the salt. A rectangular shape is given to these salt stones, cakes, or salignons, the dimensions varying at pleasure.—Patent abandoned.

3282 A. H. Smith. Clifton. Gas-heating apparatus. Dated

3282 A. H. SMITH, Clifton. Gas-heating apparulus. Dated

October 27, 1868.

The patentee constructs a square chamber, made of bricks, freclay, or any other suitable material. By means of an air shaft he introduces a current of air to act upon a series of ring burners; underneath or above these burners he employs a water cistern, made of fireclay. This cistern reaches above and below the burners. The encloses the whole of this with a bottle-shaped cylinder, made of fireclay. Over the top of this cylinder he places a dome, likewise made of fireclay, movable or fixed. The whole of the apparatus is covered with an iron grating fitted flush with the floor. The burner is supplied from an ordinary main, and lighted according to circumstances. This invention can be applied to an ornamental case, and fixed in any position above the floor, as may be required.—Patent completed. -Patent completed.

Ricel in any position above the floor, as may be required.

—Patent completed.

3283 G. ZANNI. Ironmonger-lane. Telegraph printing instruments. Dated October 27, 1868.

It is proposed to work electro-magnetic coils without the aid of the ordinary clockwork, whether driven by weights or by springs. The electro-magnetic coils employed are such as are in general use in electro-magnetic bell apparatus, and they work in connection with a battery or batteries and the earth, or with a compound magnet. Two sets of electro-magnetic coils are employed. The one set is for the purpose of giving action to drive the type wheel, and the other set acts to lock the type wheel and hold it correctly in position while the printing is taking place, and it also serves to bring down the block or presser upon the strip of paper, and thus causes the printing to take place. The type wheel is mounted upon an axis carried by the framing or case of the instrument, and also upon the same axis is mounted a ratchet wheel having as many teeth as there are characters or signs upon the type wheel, and this ratchet wheel receives a step-by-step motion from the action of one set of the electro-magnetic coils in the following manner:—Midway between two or more electro-magnetic coils is fixed a standard or support carrying near its upper end a pin or axis, upon which a horizontal bar or armature is mounted. This bar is caused to vibrate upon its axis to a slight extent in either an upward or downward direction, according as it is influenced by the one or other of the electro-magnetic coils, between which it is mounted. At

one end of the vibrating bar or armature just described a clawker or driver is carried, which, by acting upon the teeth of the ratchet wheel, gives motion thereto as well seems as are mounted upon the same axis. An arm attached to or carried by the vibrating bar or armature already described, serves to act upon a suitable brake for alternately making and breaking the circuit of the electric current of the one set of electro-magnetic coils and then of the other, and thus imparting to the bar or armature its vibrating action.—Patent completed.

3284 W. E. HICKLING, Spittlegate. Washing casks. Dated

3284 W. E. HICKLING, Spittlegate. Washing casts. Dated October 27, 1886.

The machine consists of a foundation carrying two standards, in the upper portion of which are bearings, in which the main shaft revolves. The main shaft consists of a wrought-iron box, which revolves horizontally in the bearings. In the middle of the said shaft (that is to say, at equal distances from the two bearings above mentioned) two arms project at right angles from the asid shaft, and on opposite sides therof. Upon each of these is arranged a cage or apparatus for holding the casts to be washed. These cages are free to revolve on the said arms, and are caused to revolve by means of the following mechanism:

—On one of the standards carrying the main shaft is fixed a bevel pinion, through the centre of which the main shaft revolves without moving the pinion, and on the bottom of each cage is fixed a bevel wheel, which gears with the said fixed pinion.—Patent abandoned.

2225 J. LITTLE Glasgow. Glass threaces, Dated October

3285 J. LITTLE, Glasgow. Glass furnaces. Dated October

3295 J. LITTLE, Glasgow. Glass furnaces. Dated October 27, 1868.

The object is to economize the fuel employed for heating glass furnaces, and the invention consists in introducing air inside the furnace for the thorough combustion of the fuel and its gaseous products, such air being proviously heated by passing through flues, constructed in the siege or floor and sides of the furnace, and which flues are heated simply by conduction through the siege or floor and sides from the furnace itself. One glass furnace may be provided with any convenient number of separate air flues. Each air flue is arranged in a serpentine or sigzag course, beneath a portion of the siege or floor on which the melting pots stand, and is then carried up close to the side of the furnace or melting chamber to a level above the tops of the pots, and at about the springing of the arched roof, and at that level the air is admitted from the flue into the chamber through a number of small apertures in the side wall. The inlet for the air into the flue is, by preference, arranged outside of the building, so as to be easily accessible for the adjustment of a damper or other appliance for regulating the supply of air.—Patent abandoned.

3286 J. B. O'HEA and W. BULLEN Greenwich. Firewards.

appliance for regulating the supply of air.—Patent abandoned.

3286 J. B. O'HEA and W. BULLEN, Greenwich. Firearms and cartridges. Dated October 27, 1868.

This consists in attaching a cup similar to, and answering all the purposes of, the metallic base to the fore end of the bolt, and using a paper cartridge containing its own ignition, the base of which is placed in the said cup or metallic base before the cartridge is pushed forward or entirely home into its place in the chamber by the bolt. The metallic cup is attached to the fore end of the bolt or piston by screwing or otherwise, in such a manner that as soon as it becomes deteriorated by use, and hence ceases to perform its function of preventing the escape of gas, it may be readily removed and replaced by another. The needle or striker passes through the centre of the metallic cup, and ignites the charge by striking against the fulminate contained in a cap, which is perforated and provided with a flange, and is placed in the rearend of the cartridge in such a way that, upon the explosion taking place, the flange of the cap draws out the base of the cartridge, and leaves the cup ready to receive another. Any other simple arrangement for extracting the base of the paper cartridge may be employed, or, if preferred, the base of the cartridge may be closed by a wad or plug of compressed or ungranulated powder, containing a patch of fulminate in the centre. The recess through which the needle passes is furnished with a disc or ring of india-rubber, or other suitable substance, which, at the moment of the explosion being compressed endwise, expands both internally and externally, and effectually prevents the escape of gas round the needle. In some cases, the ignition of the fulminate, when placed at the extreme base of the cartridge, may be caused by the simple percussion of a bolt or striker against the rear end of the cup.—Patent abandoned.

3287 G. FAJEN, Leighton-road, N. Ventitators. Dated October 27, 1868.

against the rear end of the cup.—Patent abandoned.

3287 G. FAJEN, Leighton-road, N. Ventilators. Dated October 27, 1868.

This consists of an apparatus made to the size of the internal part of a chimney, flue, or other opening of a circular, oval, or square construction. The apparatus is made of sheet iron, galvanized block tin, zinc, copper, or brass. On the external part there are steel springs fixed, of an elongated or globular shape; there are flaps or metal doors fitted and hung on hinges. The action of the springs on the flaps or doors are of sufficient power to hold the apparatus in position when placed in such chimney, flue, or other opening. The internal part of the apparatus is filled with a fan, screw, or worm, made of metal, and of any desired diameter, pitch of screw, or elevation thereof; this fan, screw, or worm is provided with a steel spindle, which is the centre with glass bearings, fitted on which it will rotate either in a vertical, horizontal, or in an efevated position.—Patent abandoned.

3288 W. D. Young, Edinburgh, Roofing. Dated Octo-

3288 W. D. YOUNG, Edinburgh. Roofing. Dated Octo-er 27, 1868.

3238 W. D. YOUNG, Editioria, 2007-19.

ber 27, 1868.

All the edges of the tiles or plates are bent over in the form of a hook, so that, when laid in place, they overlap, catch, or interlock into each other. The joints of the tiles or plates, by being so interlocked, form an effectual protection against rain or wind passing through. The tiles or plates may be fixed to the beams or frame by hooks or clips firmly secured to the beams or frame, the hook portion passing into and bearing upon the overturned or bent edges of the tiles or plates.—Patent completed.

8289 J. WALLACE, Glasgow. Dentistry. Dated October

27, 1868.

This relates, firstly, to the employment of aluminium as a substitute for other metals or materials used for dental purposes. The invention essentially consists in forming the plates and other parts to which artificial testh are connected of aluminium, the different pieces of which are castened together by vulcanite or other suitable material. Another part of the invention relates to engraving a design on the part of the plates next the flesh of the mouth, and by which they are more securely held in place than when formed plain or smooth.—Patent completed.



3290 E. T. VAN HECKE, Courbevole, France. Locomo tires. Dated October 27, 1868.

This consists in placing in the smokebox of a locomo

This consists in placing in the smokebox of a locomotive engine a screen or partition, so arranged as to compel the heat, smoke, and gases from the fuel to pass down wards nearly to the bottom of the smokebox before they pass out at the funnel, instead of their passing directly from the tubes up the funnel, as heretofore practised. The screen is formed of sheet iron of a suitable thickness. Its front is movable, and slightly inclined. It may be formed of one or two pleces, according to the construction of the interior of the smokebox, but in either case it is so arranged that it can be quickly opened or removed to allow of the tubes of the boiler being cleaned. The sides of the screen, which are only removed when the engine requires repairing, may be fixed to the tube plate in suitable manner.—Patent completed.

3291 J. JOHNSON, Chandos Chambers, W.C. Window

requires repairing, may be fixed to the tube plate in suitable manner.—Patent completed.

3291 J. Johnson, Chandos Chambers, W.C. Window frames. Dated detaber 27, 1868.

The barrels or drums are caused to rotate by cords, bands, or lines, rouning through suitable guides and passing down the window frames in the manner of ordinary roller blind cords, such cords, bands, or lines being secured to, and passing around, large pulleys or wheels attached to the barrels or drums for giving a certain amount of leverage, so that by pulling the cords at the sides of the frames, and thereby causing the large pulleys, and with them the barrels or drums, to rotate, the cords attached to the sashes or shutters will be wound around the barrels or drums, and the sashes or shutters consequently raised; while, on the barrels or drums being caused to rotate in a contrary direction, so as to unwind the cords, ropes, bands, or chains, the sashes or shutters being released, will descend by reason of their own preponderance over the sash weights, which latter are for this purpose made so as only partially to counteract the descending tendency of the sashes or shutters. The cords, bands, or lines, by which the barrels or drums are actuated, may be kept tightly drawn down the sides or linings of the window frames by adjustable pulleys or buttons held in position by spring catches capable of being slightly raised or depressed when requisite, so as to somewhat slacken the cords, bands, or lines, and thus permit the sashes or shutters to descend by their own weight, until the adjustable pulleys or buttons are again released, when the action of the spring catches will cause the cords, bands, or lines to be again drawn tight, and thus to instantly arrest the downward progress of the sashes or shutters.—Patent completed.

3292 T. Mordue, Newcastle. Steam botters. Dated October 27, 1868.

sashes or shutters.—Patent completed.

3292 T. Mordue, Newcastle. Steam botters. Dated October 27, 1888.

This invention is particularly applicable to compound marine engines with surface condensation, and where very high pressures and economy of fuel are required. The improved boilers consist of a main cylindrical portion, containing the usual tubes; also of one or more cylindrical or other shaped portions containing the furnaces; also of a combustion chamber uniting the furnaces; also of a combustion chamber uniting the furnaces is the tubes passing through the main portion of the boiler, then through the superheating tube or tubes placed in the steam chamber, and thence to the chimney or funnel. The water space surrounding the furnaces is connected to the main portion of the boiler by one or more water tubes, and also to the water spaces surrounding the combustion chamber.—Patent completed.

3293 R. Hamilton, Auchinheath, Lesmaghow, N.B.

chamber.—Patent completed.

3298 R. Hamilton, Auchinheath, Lesmaghow, N.B. Raileay chairs. Dated October 28, 1868.

This consists in making the chair in two halves, which are connected together by a hinge or other suitable connection under the rail. The jaws are both shaped to fit the web of the rail, and without the bottom of the rail touching, so that the rail is suspended, and the bottom does not become injured by striking the chair; whilst from the position of the hinge or connection, the downward pressure of passing trains tends to make the jaws grip the more firmly.—Patent abandoned.

grip the more firmly.—Patent abandoned.

3294 H. J. SANDERS, Brighouse. Regulating flow of liquids. Dated October 28, 1868.

This consists in an enclosed vessel or chamber having two or more inlets and one outlet to which pipes may be attached. The inlets are each provided with a valve which is capable of being adjusted to open more or less, according to requirement, by means of screw, cam or eccentric. This vessel may be formed with separate passages from the inlets to the outlet, and, by preference, one of such passages may be annular or concentric to the other, so that when the apparatus is applied to draw stale beer from one vessel or cask, and ripe or effervescent beer from another, the ripe may act as an injector to the stale. An ordinary beer pump may be applied to the outlet of this apparatus in the usual manner.—Patent abandoned.

3295 J. MORAN. Dublin. Bools and those. Dated Octo-

8295 J. MORAN, Dublin. Boots and shoes. Dated Octo-

3295 J. MORAN, Dublin. Bools and shoes. Dated October 28, 1868.

This consists in an improved mode of attaching the soles to the upper leathers of riveted boots and shoes. The invention is carried into operation as follows:—A drill or channel of about one-third the thickness of the sole is cut in the sole, near to the edge. This drill or channel is of sufficient size to hold the heads of the rivets, the rivet holes being made in the channel, and the rivets driven and riveted in the usual manner upon an iron last, so that when the sole is fastened to the upper, the rivet heads are at the bottom of the drill or channel, where they can readily be covered by turning down the leather raised to make the drill or channel, and the heads of the rivets will not be at all exposed to view, and will not be worn off until the sole is itself worn out or requires replacing—Patent abandoned.

3296 M. A. Soul, Finshury-place.

Permanent way.

Patent abandoned.

3296 M. A. SOUL, Finsbury-place. Permanent way.
(A communication). Dated October 27, 1868.

This invention relates, first, to the arrangement of improved parts of the permanent way of railways, and to the construction of certain of these parts, principally the sleepers and chairs, in cast iron, malleable cast iron, wrought iron, steel, or in fireclay or other earthy material; also to the combination of such parts with wood, as the holding or supporting parts of the permanent way, which is effected in such a manner as to ensure elasticity, stability, and economy, in such permanent way. Second, to a novel form of fish joint for uniting the ends of the rails, the fish joints being made in two halves in such a way that they can be held together by clamp or clip pieces of wrought or east iron or steel.—Patent completed.

3297 C. E. BROOMAN, 166, Fleet-street, E.O. Condensers.

3297 C. E. BROOMAN, 166, Fleet-street, E.C. Condensers.
(A communication). Dated October 28, 1868.
This consists in elevating the condenser above the water

level to a point above that at which the weight of the atmosphere will support a column of water, and connecting it by means of a pipe with the hot well, thus forming a syphon crowned with the condenser, of which the first pipe is the short leg, and the last the long leg. The exhaust pipe of the engine also discharges into the condenser. By this arrangement, the water of condensation is raised into the condenser by atmospheric pressure, and removed from it together with the condensed steam by gravity.—Patent abandoned.

3298 A. WILSON, Barrow-in-Furness. Metallic moulds.

is raised into the condenser by atmospheric pressure, and removed from it together with the condensed steam by gravity.—Patent abandoned.

3298 A. WILSON, Barrow-in-Furness. Metallic moulds. Dated October 28, 1863.

This consists in making metallic moulds for casting metals in such a manner that the entrance of air through the junctions of the parts of the moulds during the use of the moulds is obviated, and a sound casting thereby produced. The invention is particularly applicable to metallic moulds, made in two parts or halves, for casting steel ingots, but may also be applied to metallic moulds for casting other metals and articles, and also to metallic moulds made in more than two parts. The invention consists in the formation of a cavity at each of the junctions or joints of the parts of the metallic mould, and filling the said cavity with sand, fireday, or other fireproof material. By the use of the cavity described and illing material, a perfectly airtight junction is formed, and the entrance of air through the said junction into the metal cast in the mould is prevented. In making a mould for casting steel ingots, the inventor makes along the whole length and at the outside of the joints or junctions of the two parts of the mould an opening or cavity of the required size to hold the sand or other filling material employed. He covers the cavity at the junction by means of a metallic cover, strap, or plate, which is fastened in its place on the outside of the mould together, or by any other convenient mechanical arrangement. When the cavities described are filled with sand, wood, or other filling material, a core is formed along the whole length of the joints of the mould; or, instead of forming the cavity by making a depression on the outside of the junction of each half mould, and covering it by a cover, strap or plate, the cavities may be made in the balf moulds themselves either by casting them in the half moulds or fixing pieces to the half moulds. In this case, apertures or holes may be left to carry

3299 W. DAWES, Leeds. Pianofortes. Dated October 28,

Patent completed.

3299 W. DAWES, Leeds. Pianofories. Dated October 28, 1868.

This consists in substituting for the ordinary wood or cast-iron "frame" of the instrument, a compensating frame, so constructed, that it compensates for the alterations in length and tension of the wires or strings, through variations of temperature, by its own expansion or contraction for heat or cold, in a like or necessary manner or degree to the strings themselves, the amount of compensation being gauged or determined by the kind mixture or alloy of metal or metals employed in the frame, or by the quantity or proportion of zinc. brass, or other expansive metal used. Second, in a novel construction of soundboard for increasing the amount of vibration, and thereby improving the tone of the instrument. This is effected by the use of a double soundboard, constructed with a space of about lin between the front and backboards, and this soundboard is sometimes constructed with the back somewhat smaller in size or area than the front, and the two are firmly attached together, in such a manner, that this difference in size causes compression upon the frontboard, and tension upon the backboard, and thus increase the resonance and tone; and in some cases, this tension and compression is produced by a kind of lattice or open back of separate strips or bands, each one having the necessary amount of tension, by means of screws or wedges, as may be desirable. Third in the employment of a revolving or other mechanical movement actuated by the feet or otherwise, for prolonging the notes of the instrument, by a succession of extremely rapid blows or strokes upon the wires (or upon additional wires placed at the back of the instrument, either from the usual or ordinary hammers, or others, or both, such blows or strokes upon the succession of extremely rapid blows or strokes upon the succession of extremely rapid blows or strokes upon the succession of extremely rapid blows or strokes upon the prolong-ing the notes of the instrument, by a successio

contrary, with as much amoothness and connection as possible.—Patent completed.

3300 G. E. Donisthorps, Leeds. Packing for pistons. Dated October 28, 1868.

In order to form a steam or fluidight packing to a piston or gland, the inventor places around the piston or inside the gland, a flexible bag, of a ring form, and this bag he distends by putting it in connection with a small reservoir containing a fluid, which is maintained at a pressure exceeding the working differential pressure of the steam or other fluid with which the engine is worked by a piston or plunger forced inwards into it, by a weighted lever, by a spring or otherwise. The action of the lever should be so regulated as at all times to be a little above the working pressure in the cylinder at all parts of the stroke, especially when great expansion is adopted. In place of employing a bag, as above described, a groove might be formed around the piston or the gland, and this groove might be kept filled with fluid, under a pressure greater than the working pressure in the cylinder of the engine; the parts may either be made to fit together with sufficient truth to prevent too free an escape of the packing or lubricating fluid, or washers of leather may be placed on either side of the groove, to limit the escape of the packing and lubricating fluid. At the front of the groove around the piston or gland, split rings of metal may be placed, if desired, so that the rings shall be pressed outwards from the groove when fluid; these rings will also prevent too free an escape of the fluid from the groove around the piston or gland; the outer dismeter of the gland would have to expand, and, at the same time, the internal portion would have to contract, to effect a steamtight packing on the piston or defended to the processed outwards. Tooth brushet. -Patent completed.

3301 P. B. Cow and J. Hill, Cheapside. Tooth brush Dated October 28, 1868.

Dated October 28, 1868.

There has lately been introduced into the market a porous form of vulcanized india-rubber, called india-rubber sponge. According to this invention, this material is used as a substitute for bristles in the manufacture of brushes. The inventors cement or fix a piece of india-rubber sponge to a back or handle, and form grooves on

the surface of the spongy material to obtain a brush-like action.—Patent completed.

3302 C. KELSON, Lombard-street. Horse collars. (A com-unication). Dated October 28, 1868.

2302 C. Kelson, Lombard-street. Horse collars. (A communication). Dated October 28, 1868.

This consists in constructing collars hollow, and of a semi-shell shape form. The collar is rendered much lighter, and its elasticity greatly increased, by constructing the same with numerous perforations. These may be either circular, oblong, or of any other form that the taste of the manufacturer may suggest. Within the concavities of the collar plates are secured the rein eye and also the trace clip. These may be secured by independent bearings or attached to a hamebow in the ordinary manner, in which case, the hames are permanently secured to the collar.—Patent abandoned.

3303 W. PROWETT, Gillingham. Knitting machines. Dated October 28, 1868.

In constructing a knitting machine, the inventor employs In constructing a knitting machine, the inventor employs bearded needles, similar, or nearly so, to the ordinary hosiery needles, and he mounts them on slides, which are actuated in such a manner as to give to the needles an endway traverse. The inventor generally makes the machine double acting, by mounting needles on each end of the slides; the machine, in this case, produces simultaneously two fabrics, one at the front, the other at the back of the machine. The needle are, by preference, worked in pairs, so that each slide carries four needles. The slides are arranged slide by side in suitable guides; their number depends on the width of the work the machine is required to make, and on the gauge of the machine.—Patent abandoned.

depends on the width of the work the machine is required to make, and on the gauge of the machine.—Patent abandoned.

3304 J. J. Tongur, Southampton-buildings, W.C. Fire alarum. (A communication). Dated October 28, 1868.

This consists in the combination of two thermometers having an unequal sensitiveness, and so arranged as to permit the warning or signal apparatus to accomodate itself in an automatic manner to the normal variations of the temperature in which the apparatus is placed without such signal or warning apparatus being brought into action, the thermometers being so arranged that a warning signal or indication will always be given with promptitude, and, consequently, in an efficacious manner every time the temperature changes suddenly, from an accidental or other cause, such warning, signal, or indication being continuously maintained when the temperature of the place in which the apparatus is placed has risenabove a certain predetermined limit. The two thermometers employed, either or both of which may be liquid or metallic, are, according to this invention, so arranged that the one is very sensitive and indicates almost instantaneously the degree of temperature of the situation in which the apparatus is placed, the other thermometer taking a longer time to indicate a corresponding temperature, and so establish an equilibrium between the two thermometers, which, by preference, are so constructed as to travel over the same distance for each degree of heat indicated. The two thermometers are placed in connection with the two poles of an electric or galvanic pile or battery, the two thermometers are placed in connection in incomplete, but should any sudden increase of temperature occur, the sensitive thermometer operating more rapidly than the less sensitive one, acts by means of suitably arranged contrivances, to place the two thermometers in electric communication, and so complete the electric circuit, which will then, by any of the well-known means, set in motion warning signals, alarums, or other i

pleted.

3305 M. Brison, Hinde-street, W. Shaft couplings. (A communication). Dated October 28, 1868.

This consists in constructing a shaft coupling with an internal split, sleeve, or tube to fit the ends of the shafting, the sleeve having external conical ends, the larger diameter being in the centre, and the smaller at the ends. Each end of the sleeve is fitted with a compressing or tightening shell, furnished with means for acrewing their internal ends together, which firmly presses the internal split sleeve to the shafting, owing to its conical shaped ends. The internal split sleeve is constructed sufficiently thin and light in its cross section to be compressed concentrically to fit shafts of slightly varying diameters, and the outer or compressing shells are so constructed that the strain falls equally on each end of the coupling, and they are so connected that they represent the continued strength of the shafting through the coupled joint.—Patent completed.

3306 B. DORSON and J. CLOUGH. Bolton. Preparing col-

3306 B. DORSON and J. CLOUGH, Bolton. Preparing cot-in. Dated October 29, 1868.

3306 B. Dorson and J. Clough, Bolton. Preparing colton. Dated October 29, 1868.

The inventors employ a balanced lever, the upper end of which forms a guide to guide the fibres in passing from the front drawing rollers to the trumpet mouth placed above the calender rollers which deliver the sliver to the can or coiler, or other receptacle. The lower end of the lever takes into a slot in the end of a vibrating rod, which is connected to and actuated by the usual rocking shaft of the back stop motion. As long as the proper quantity of slivers is passing to the calender rollers the slivers hold the lower end of the balanced lever clear of the vibrating rod, and the machine continues its work, but if one or more slivers break or the quantity of fibres is otherwise deficient, the upper end of the balanced lever rises and the lower end drops, and is then struck by the end of the slot in the vibrating rod, the lower end of the lever coming against a stop in the standard supporting the balanced lever. By this means the rod is stopicd, and the rocking shaft being also arrested, moves the driving strap from the fast to the lower pulley, in the usual manner. When the end or ends have been pieced up, and the frame is again started, the end of the vibrating rod comes against the lower end of the balanced lever, and replaces it in its proper working position. The balanced lever can be adjusted by a regulating screw connected to the lower end of the said lever.—Patent completed.

3307 R. MELDRUM, Cupar, N.B. Utilizing waste steam.

3:907 R. MELDRUM, Cupar, N.B. Utilizing waste steam. Dated October 29, 1868.

This consists in a chamber or chambers (which latter are connected with each other by proper openings) in which fans are mounted, and from which, as well as the holler, cylinder, and parts in connection therewith, common air has been extracted either through displacement or by an air pump. The steam, when allowed to bear on these fans, owing to their position, will drive them round



at a very great speed; but in accordance with the power of the steam, and there being a sufficiency of the above, the steam will, in its progress, lose its power until it has none, or, in other words, be received into a vacuum. These chambers, by their proper ducts, will receive the condensed steam, from which, or other suitable place, it may be pumped back to the boiler, thus forming a continuous revolution of the motive power.—Patent abandoned.

8308 F. A. BLANCHON, Paris. Tops. Dated October 29

3:308 F. A. BLANCHON, Paris. Tops. Dated October 29-1863.

This consists in making use, as a motor for driving tops, of a current of air, obtained by mere insufflation with the human mouth or by suction, and which current is caused to pass through the top, and through suitable re-acting or exit openings provided in the periphery, the current of air imparting rotary motion to the top by its re-acting effect, in a manner analogous to that of the steam in the apparatus called the collepte. The current of air is produced, by preference, by insufflating with the mouth into a tube, situated in or applied to the axial part of the top, suitable openings provided in the periphery of this latter, allowing the exit of the insufflated ur, which, in re-acting on the said exit openings, will impure that top may form either an adhering part of this latter or a separate part, and the same is adapted in an opening provided in the centre of the upper part of the top. Musical or other suitable sounds may be emitted by providing the top with suitable metal tongues or vibrating reeds, or other suitable sonorous parts, and allowing a portion of the insufflated air to act on these sonorous parts.—Patent completed. completed.

completed.

3309 W. H. Liddell, Edinburgh. Treating pig skins.
Dated October 29, 1868.

The inventor first selects the pig skins according to the purposes for which their general qualities render them most suitable; he then cuts and extends them in a contrary way to anything hitherto practised. For long straps the skins are out the longest way, out of the most proper thickness of the skin, and then the other parts of the skin can be economically used in making leggings, bags, and bandages. The bandages hitherto generally used are mule of hard and impervious leather; while the pig skin bandage, according to this method of treating, will be found firm and of a porous nature, admitting of free perspiration.—Patent completed.

3310 R and I WHYTE Glassow. Looms. Deted Octo.

3310 R. and J. WHYTE, Glasgow. Looms. Dated Octo-

3310 R. and J. Whyte, Glasgow. Looms. Dated October 29, 1868.

This relates to avrangements of mechanism for actuating the set or sets of compound or multiple shuttle boxes of looms for weaving striped, checked, and other ornamental or figure fabrics requiring two, three, ormore shuttle boxes and shuttle in each set. The invention consists, first, in the construction and arrangements of the parts of pattern mechanism, and shuttle box, moving and holding mechanism generally, for actuating the shuttle boxes of power looms. Second, in the construction and use of duplex pressers for actuating a lever connected to the shuttle box of a power loom, so as to shift and set or bring these to rest by a positive motion, taken or derived from one of its main shafts, whether the lateral acting position of the depressers is determined by simply bringing it to rest on the pattern pins in the improved manner herein distinguished, or by the positive motion of the pins in turning the barrel. Third, in the construction and use of a reversing pattern barrel with many annular rows of pattern pin holes, having a setting or pattern lever traversed across these holes intermittently by pins in the barrel, for regulating or setting the actual moving mechanism of power loom shuttle boxes, whether the pattern pins used actually move the pattern or setting lever or only form a rest therefor. Fourth, in the construction and use of pattern barrels with simple resting pins only, for determining the position of the pattern lever and depressers of the actual shuttle box moving mechanism of power looms.—Patent completed.

3311 W. Scott, Leeds. Cleansing seol. Dated October 29, 1868.

3311 W. Scott, Leeds. Cleansing wool. Dated Octo-

3311 W. Scott, Leeds. Cleansing secol. Dated October 29, 1868.

This relates to means of drying and cleansing wool or other fibrous substances after any of the ordinary processes of washing such wool or other fibrous substances. A swift or spiked drum of either cylindrical or polygonal form, capable of revolving in conjunction with a spiked roller within an enclosed chamber or framework casing, is employed, such chamber having a door to open and close for the introduction of the wool or other fibre to be operated upon, and the bottom part grated or perforated to allow the dirt or extraneous matters to pass through. The bottom part is circular, and only of suitable radius for the spikes of the swift to run clear of it. The upper part is also (by preference) circular, but raised sufficiently high to clear and leave a suitable amount of space above the spiked roller which revolves above and in near contact with the swift.—Patent abandoned.

tact with the swift.—Patent abandoned.

3312 J. and W. ADAMS, Islington. Bricks and tiles.
Dated October 29, 1868.

This consists in treating or preparing clay, loam, or brick eirth, by adding thereto, and mixing therewith, street or road sweepings, road scrapings, street slop or drifts, chalk and sand, or waste from stone sawing, commonly known as stone sand, or stone crushed, for the manufacture of bricks and tiles, whereby the patentees are enabled to dispense with ashes; also, at the same time, improve the texture, colour, and quality of the said articles, and produce superior bricks and tiles from inferior clay. The number and quantities of the mixing materials above mentioned must be varied according to the colour required and the quality of the materials. The drift and sand, or that whole of the materials being mixed together and added to the clay or loam as the case may require.—Patent completed. completed.

completed.

3313 J. HEATON, Langley Mills. Iron and steel. Dated October 29, 1863.

This consists, first, in the employment of the cinder or slag obtained in the production of steel, or of steely iron, or of iron from products which have been obtained by the action of nitrate of sods or of nitrate of potash upon cast iron, either in a converting vessel or apparatus, such as is described in the specifications of letters patent granted, Nos. 793 and 1867, and No. 1295 of 1866, or in any other suitable furnace or apparatus. Second, in the employment of the product obtained by heating together oxide of iron and carbonate of sods or potash, or caustic sods

potash, or mixtures of the same for the productions of malleable iron or steel from cast iron in what is known as the puddling process, and also its employment in the blast furnace for the purpose of improving the quality of cast or pig iron to be produced. The proportions in which such cinder or slag is employed will depend upon the impurities existing in the cast iron or iron ore, but it is found that when the cinder or slag herein referred to is employed in the proportion of about 14th, to every charge of about 4cwt, of cast iron, and in about the same relative proportions when employed in the blast furnace, that good results are obtained.—Patent completed.

3314 H. WALLWORK, Manchester. Taps or valves. Dated October 29, 1863.

3314 H. WALLWORK, Manchester. Taps or valves. Dated October 29, 1863.

This relates principally to self-closing valves or taps suitable more particularly for water, beer, oil and oth riquids, and consists in the construction, arrangement, and combination of the parts. The valve is a lifting valve, and closes by the pressure of the liquid. The stem part which guides its movement is formed with grooves or channels in the ordinary manner, or it is made tubular, and holes are formed laterally in its upper part to allow the fluid to pass into and through the hollow stem. The seating of the valve is flat, and the facing of the valve (corresponding to the cone part of the ordinary valve) is formed by a ring of india-rubber, leather or other suitable material. The head of the valve is coned. It is lifted when opened by the end of a lever handle acting against the end of the stem of the valve, this lever handle passing through a cylindrical or cone plug fitting a hole formed in the body part of the tap. In using this improved tap or valve, as above described, the lever handle will have to be held so as to keep the valve open so long as the fluid is required to flow, as, when the handle ceases to be held, the valve is closed by the pressure of the fluid. To prevent any damage from the sudden shutting of the valve, an air vessel, having an india-rubber or other suitable elastic diaphragm at its upper end, is backed by an india-rubber or other spring, and arranged so that the orifice for the average pressure of the fluid for which the valve is used, greater the pressure and smaller the orifice in proportion.—Patent completed.

3315 R. Oxland, Plymouth. Extracting tin. Dated Oc-

3315 R. OXLAND, Plymouth. Extracting tin. Dated Oc-

Patent completed.

3315 R. Oxland, Plymouth. Extracting tim. Dated October 29, 1868.

This consists in the employment of grinding apparatus. First, for reducing raw ores of tin to fine powder after they have been partially pulverized by stamps or by a crusher; and, second, for grinding burnt or calcined ores in such a manner as to rub off the adhering oxide of fron and other impurities from the binoxide of tin, or black tin of the Cornish miner, without pulverizing the black tin more than can possibly be avoided. A mill is preferand 2ft deep, provided with a hollow central cone, rising from the bottom to the same height as the upper edge of the pan. Through this cone is a perpendicular shaft, which carries a runner supporting a muller, on which are fastened iron plates or shoes forming the upper grinding surface, which moves over a bed of cast-iron plates fastened to the bottom of the pan. The shoes of the muller are twelve in number, leaving inch radial spaces or channels between each plate. If the ore be ground in charges, these spaces are left open, but if ground in a continuous stream of supply of ore and exit they are filled up with hard wood on end grain to the grinding surface. The about an inch wide on the top, extending three-fourths of the width, so beveiled from the bottom upwards that the end grain wood, with which the channels are filled up, may be held firmly down. Each plate is sufficiently wide to fill up the bottom of the pan, excepting a space of 4in, but were the inner edge and the central cone, and a space, leaving a channel 2in, wide between the the outer edge and the interior of the pan. Between each of the four plates a space an inch wide is left, which is also filled up with hard wood, presenting the end grain to the grinding surfaces. At equal distances on the inside of the pan are slots or channels, for holding three curved pieces of iron, so fixed as to cause the throwing of the pulp from the circumference to the centre when the ore is ground, by running it in a stream of water into t

### APPLICATIONS FOR LETTERS PATENT

Dated May 4, 1869.

1862 W. Seed, Preston, Lancashire. Improvements in furnaces for steam boilers and other purposes.

1863 E. and E. Thomas, Meifod, Montgomeryshire, and J. Morris, Weishpool, Montgomeryshire. A new or improved agricultural implement for forming the surface of the ground into complete ridges, and at the same time depositing manure and sowing seed therein.

1864 O. Topham, Coleman-street, Bunhill-row, Middlesex. Improvements in machines for mincing meat, vegetables, and other similar substances requiring to be minutely divided.

1865 R. Wappenstein, Manchester.

minutely divided.

1365 R. Wappenstein, Manchester. Improved system and apparatus for registering the numbers of passengers travelling in or on omnibuses and other conveyances, or entering public gardens and buildings.

1366 T. Cockroft, Bridge-lanes, Hebden Bridge, Yorkshire. Improved means and method of hanging window

sashes.

1367 J. Bullough, Accrington, Lancashire. Improvements in warping or beaming machines.

1368 R. Fennelly, Wellington Chambers, London Bridge.
Surrey. Improvements in cases for the conveyance of

fresh meat.

1369 T. Perkins, Hitchin, Hertfordshire. Improvements in reaping and mowing machines.

1370 W. E. Gedge, Wellington-street, Strand. An autodynamic carbonic acid gas apparatus for raising liquids and for the preservation of beer.

1371 A. and E. Fau, Castres, Department of the Tara, France. An improved process for washing, freeing from burs, and hairing skins.
1372 J. Tail, Falstaffyard, Southwark, and A. Williams, Great George-atreet, Westminster. An improved method of, and apparatus for bending, curving, straightening, and flattening metallic sheets, plates, or bands, and also round, flat, square, angular and other bars of iron or other metals.

1373 A. V. Newton, Chancery-lane. Improvements in railway carriage wheels.

1373 A. V. Newton, Chancery-lane. Improvements in engines to be used as motors or as pumps for raising or forcing liquid or aeriform bodies.

1375 C. F. Franklin, Abingdon-street, Westminster, and E. Dubois, Primrose-streat, Bishopsgate. Improvements in accommend.

nts in gas engines.

Dated May 5, 1869.
1376 T. Sibley, Ashton-under-Lyne. Improvements in

Dated May 5, 1869.

1376 T. Sibley, Ashton-under-Lyne. Improvements in velocipedes.

1377 D. Adamson, Newton Moor Iron Works, near Hyde, Chester. Certain improvements in portable and other steam engines and boilers, and in apparatus employed in the construction thereof.

1378 J. F. Kent, Thornton Heath, Surrey. An improved mortsing, tenoning, and sawing machine.

1379 G. Clark, Northumberland-street, Strand. Improvements in cartridges and appliances for their construction, manufacture, and use.

1380 W. MacKean, Paisley. Improvements in the manufacture of cattle food.

1781 E. H. Richmond, King William-street, City. Improved apparatus and process for preserving fresh meat and other animal food, fish, poultry, and game, and also ingredients, matters, or substances to be used in combination with the said apparatus.

1382 A. Cocke, Water-lane, City. Improvements in apparatus for ventilating railway and other carriages, which improvements are also applicable to ventilating apartments and other places, and to creating draft is chimneys.

1383 H. Highton, Sussex-square, Brighton, Sussex. Improvements in making, hardening, and preserving artificial stone, and in preserving the surfaces of wells and other surfaces.

1386 C. Moore, Sketty, near Swanses, Glamorganshira. An improved screw propeller for ships.

1385 J. E. Phillips, Grantham, Lincolnshire. Improve-

valves for steam engines.
1386 J. E. Phillips, Grantham, Lincolnshire. Improvements in sewing machines, and in tables for the same parts of which improvements are applicable to other ma-chinery.

chinery.

1387 R. H. Ray, Walden Hall, Saffron Walden, Essex.
Improvements in the construction and arrangements of
reaping and mowing machines.

1388 T. Welton, Grafton-street, Fitzroy-square, Middlesex. A new method of applying oxygenated and other
gas-charged charcoal for curative and other purposes.

gas-charged charcosi for curative and other purposes.

Dated May 6, 1869.

1889 E. N. Hudson, Percy-terrace, Bayswater, Middlesex. Improvements in carriages, vehicles, or conveyances propelled or moved by the power of persons carried or conveyed thereby.

1390 H. E. Newton, Chancery-lane. Improved apparatus for enlarging and reducing basso-relievos, plans or drawings, and writings.

1391 C. D. Abel, Southampton-buildings, Chancery-lane, Improvements in the treatment of cast iron for the production of wrought iron and steel therefrom.

1392 J. Tolson, Dalton, near Huddersfield. An improvement in, or applicable to, certain apparatus employed for cleaning the cards of carding engines or machines having cylinders or rollers clothed with cards.

1393 W. Bennett, Aston, near Birmingham, and J. Currall, Birmingham. Improvements in kitchen ranges.

1394 I. and G. Battinson and T. Whitehead, Halifax. Improvements in machinery for combing wool and other fibres.

fibres.

1895 W. Galloway, Craigie, Ayrabire. Improvements in apparatus for brakeing or retarding railway trains.

1896 W. Galloway, Craigie, Ayrabire. Improvements in apparatus for communicating between passengers, enginemen, and guards in railway trains.

1897 J. Needham, Chiawick, Middlesex. Improvements in velocipedes.

1898 G. Kent, High Holborn. An improved refrigerator.

1398 G. Aen, flight Lordon.

1399 J. M. Hart, Cheapside, City. Improvements in the construction of safes or depositories for security, strong rooms, and such like places; also in fireprooting the same, part of which improvements is also applicable to the construction of parts of locks.

1400 G. T. Bousfield, Loughborough Park, Brixton, Surrey. Improvements in suspenders of braces.

Dated May 7, 1869. 1401 E. Seyd, Princes-street, City. Improvements in

flui fluid meters. 1402 R. Fennelly, Wellington Chambers, London Bridge, Southwark. Improvements in apparatus for washing out

cases. 1403 D. and A. Posener, Mansell-street, Goodman's Fields, Middlesex. Improvements in pipes for smoking

1404 G. N. Mansfield, Great Portland-street, Middlesex.

An improved manufacture of parquet flooring.

1405 J. Ramsbottom, Leeds, and T. M. Pearce, Bradford.
Improvements in steam and hydraulic apparatus for pumping, forcing, and measuring water, and for raising

weights.

1406 A. J. Murray, Albany-road, Camberwell, Surrey,
Improvements in reaping and mowing machines, parts of
which improvements are applicable to other machines.

1407 F. Leonardt and H. Hewitt, Birmingham. Improve-

140? F. Leonard and H. Hewit, Birminguam. Improve-ments in metallic pens, penholders, and metallic boxes for holding pens and other small articles. 1408 J. G. Tongue, Southampton-buildings, Chancery-lane. Improvements in machinery or apparatus for the manufacture of envelopes.

Dated May 8, 1869. 1409 F. C. Knowles, Lovell Hill, Berks.

purifying and converting cast iron into malleable iron or into steel, and for the making and use of materials and appliances for the same.



1410 W. Henderson, Glasgow. Improvements in appartus for finishing woven fabrics.
1411 B. Hunt, Serle-street, Lincoln's Inn. Improve-

ments in horse collars.

1412 H. Myers, Miles Platting, Manchester. Certain improvements in the furnaces of locomotive and other believes.

improvements in the furnaces of locomotive and other boilers.

1413 E. Maybury, G. Matthews, and E. Marston, Pendleton, Lancashire. Improvements in puddling furnaces.

1414 R. and G. Cadbury, Birmingham, and J. M. Rendall, Torquay, Devonshire. A new or improved description of biscuit manufactured from the cacao bean.

1415 E. S. Copeman, Upper King-street, Norwick. An improved method of, and apparatus for, communicating between the several parts of railway trains.

Dated May 10, 1869.

1416 A. B. Hawes, India Office, Whitehall, Westminster.
Improvements in bottles and flasks; also applicable to jars and other vessels.

1417 W. N. Nicholson, Trent Iron Works, Newark, Nottinghamshire, Improvements in hay-making machines.

Nottinghamshire, Improvements in hay-making machines.

1418 H. R. Lumley, Marlborough-place, St. John's Wood. The treatment of molten iron in order to free it from all impurities.

1419 H. A. Dufrene, Rue de la Fidélité, Paris. Improvements in desiccating and preserving meat and other organic substances.

1420 E. Field, Chandos Chambers, Adelphi, Westminster. Improvements in steam fire engines and other pumping apparatus.

1421 C. Lauth, Paris, Rue de Fleurus. Improvements in dyeing and printing.

1422 R. Blezard, Liverpool. Improvements in apparatus for dressing millstones.

1423 W. Currie, Edinburgh. Improvements in the manufacture of cushions, seats, mattresses, life preservers, and other articles requiring to be stuffed.

1424 M. S. Wolfgang, Fairfield, Stratford-le-Bow, Middle-Bex. Improvements in cricket and other balls.

1425 R. F. Hoppe, Cheapside, City. Improvements applicable to musical boxes, albums, and other similar articles.

1426 W. E. Newton, Chancery-lane. An improved process and composition for hardening common control of the process.

articles.

1426 W. E. Newton, Chancery-lane. An improved process and composition for hardening common or grey cast iron, and for converting articles of iron into steel, or imparting thereto a steely character.

1427 W. E. Newton, Chancery-lane. Improvements in

gun locks.

1428 W. B. Smith, Coventry, Warwickshire. Improvements in the construction of watches, chronometers, and other timekeepers. 1429 J. Withers, Handsworth, Staffordshire. Improve-

other timekeepers.

1429 J. Withers, Handsworth, Staffordshire. Improvements in water meters.

1430 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in bronze ordnance.

1431 H. Bessemer, Queen-street-place, Cannon-street, City. Improvements in the manufacture of malleable iron and steel, and in furnaces and apparatus employed for their fusion and treatment.

1432 H. Bessemer, Queen-street-place, Cannon-street, City. Improvements in the construction and mode of working furnaces, and apparatus employed in fusing malleable or wrought iron and steel and pig or other carburets of iron, and obtaining cast steel or homogeneous malleable iron therefrom.

1433 H. Bessemer, Queen-street-place, Cannon-street, City. Improvements in the conversion of fluid crude iron and molten pig or other carburets of iron into fluid homogeneous malleable iron and steel, whether such pig or other crude iron is used alone, or is mixed with a portion of malleable or more or less decarburized iron in a solid or fluid state.

or fluid state.

1434 H. Bessemer, Queen-street-place, Cannon-street, City. Improvements in the treatment of crude or pig iron and other carburets of iron, and in the apparatus employed for such purposes.

1435 H. Bessemer, Queen-street-place, Cannon-street, City. Improvements in the construction and mode of working blast furnaces employed for smelting the ores of iron, and in the mode of employing and utilizing the gaseous products of such furnaces, and also in the construction and mode of working blast engines employed to force air into blast and other furnaces.

# NOTICES OF INTENTION TO PROCEED WITH

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PATE	
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3945 E. Butterworth	50 F. R. A. Glover
3956 F. A. V. Michel	54 H. G. Fairburn
3963 J. Laurie and J.	57 W. Tatham
Whittaker	60 R. Wigram
3964 S. and W. Fox, J. Ref-	67 W. E. Gedge
fitt, and G. Grange	68 R. Legg
3965 A. G. Cazalat	69 F. S. Thomas
3969 W. Winter	88 A. Henry
3972 P. Gornall and R.	111 T. Mortlock
Gornall	163 J. H. Johnson
3982 A. Barclay	487 A. Ransome
3990 J. Seelig	905 J. J. Bodmer
1 J. Heap	957 W. F. Procter
2 T. Singleton	1003 D. Osborn
3 S. Lyons	1016 S. Sharrock
15 A. Carter and C. R. E.	1083 J. Dewar
Grubb	1098 J. Hynam
20 S. J. Peet	1118 S. F. Shore
26 W. Prosser	1211 H. Lee
29 J. J. Hays	1245 W. R. Lake
30 J. Balbirnie	1282 A. Watson
31 J. H.Johnson	1306 I. J. J. Lewis
36 S. Remington	1310 H. A. Bonneville

41 E. Robbins

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The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

# PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID. 1321 J. and T. Mellodew and C. W. Kesselmeyer 1360 P. H. Colomb 1376 W. Riddle

meyer 1337 J. Roscoe

# PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1291 H. K. York 1317 J. R. Swann 1350 W. Prosser 1263 A. T. Becks 1264 H. and J. Douglas 1281 J. Marsh 1282 G. Davies 1352 J. M. Hart

#### LIST OF SEALED PATENTS. Sealed May 7, 1869.

Sealed Ma
3073 J. Barcroft
3405 T. Rose and R.
E. Gibson
3408 G. Clark
3411 J. H. Wilson
3418 T. R. Crampton
3420 T. Vaughan and E.
Watteeu
3427 F. Holmes
3445 W. Thomas
3447 H. Aitken and R. 3471 H. Aitken

7, 1869.
3482 E. Hogg
3487 S. W. Campain
3527 A. Leykauf
3533 G. Eguillon
3718 A. Homfray
3725 T. Kennan
3951 H. Yorath
3979 W. R. Lake
595 W. R. Lake
641 F. A. Gatty
759 W. R. Lake

#### Seeled May 11 1869

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3441 W. Donisthorpe	3504 F. O. Ward, W. Ibe
3442 G. P. White	son, and A.
3443 J. Kellow	Southby
3447 J. Dendy and J.H. W.	3525 D. Burns
Biggs	3526 A. Guthrie
3454 R. A. Gold	3563 W. H. Dreaper
3457 C. Jones	3571 T. Prideaux
3462 P. Hill	3658 J. H. Johnson
3464 R. Beckley and J. J.	3662 P. Ellis
Hicks	3663 P. Ellis
3467 W. Richardson	3699 J. R. Swann
3484 A. McNiel and W.	3906 J. H. Johnson
Wheaton	3939 W. H. Ridgway a
3485 R. M. Boniwell	F. W. Walker
3488 J. Jones and S. P.	3985 G. M. Wells
Bidder	187 H. A. Bonneville
3501 C. W. Siemens	518 E. Hewett
3517 W. Avery and A.	803 L. Engel
Fenton	

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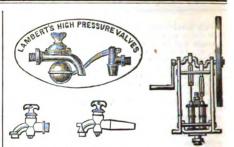
863	1213	1252	1266	1278	1289	1303	1315
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1207	1251	1265	1276	1288	1302		

#### OF SPECIFICATIONS PUBLISHED LIST For the week ending May 8, 1869.

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2966	0	4	2988	1	6	2999	0	4	3009	0	10	3019	0	4	3029	0	8
2976	0	8	2989	0	8	3000	0	4	3010	0	4	3020	0	4	3030	0	8
2980	0	8	2990	1	4	3001	0	8	3011	0	10	3021	0	4	3031	0	4
2981	0	8	2991	0	10	3002	0	4	3012	0	4	3022	0	10	3033	0	4
2982	0	4	2992	0	8	3004	0	4	3014	0	4	3023	0	8	3034	0	8
2984	0	4	2993	0	4	3005	0	4	3015	1	10	3024	0	8	3064	0	4
2985	0	4	2995	1	2	3006	0	4	3016	0	4	3026	0	6	3066	0	8
2986	0	4	2996	0	4	3007	2	10	3017	0	6	3027	0	8	3101	3	2
2987	0	4	2998	0	10	3008	0	6	3018	1	2	3028	0	6			

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Science and Art.—A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVT.] SCIENCE AND ART .- A striking instance of the



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The above Lubricators grease every particle of steam previous to passing through the valves into the cylinder.

A 47

# PHILLIPS'S PATENT SOLID FLANGE

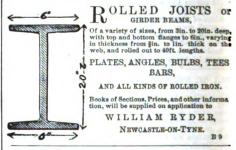
PHILLIPS'S PATENT SOLID FLANGE
GIRDERS give double the strength of ordinary riveted
plate girders of corresponding sectional area and weight, and are
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Particulars furnished on application to the patentees, W. and T
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PHILLIPS'S PATENT IMPROVED FIRE-PROOF FLOORING
dispenses with the use of all Wooden Fillets and Laths; can be laid
by any labourer, and the ceiling plastered immediately; is light and
indestructible, and in combination with the Iron Joista, forms a perfect structure at a trifling cost over the ordinary combustible Timber
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W. and T Phillips Patentee at Court

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are specially manufactured from a tough and elastic Metal, and
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Three First-Class PRIZE MEDALS were awarded to SAMUEL
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HONOUR awarded to COCKER BROTHERS, by the Society of Arts
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# MECHANICS' MAGAZINE.

LONDON: FRIDAY, MAY 21, 1869.

### THE CAPTIVE BALLOON.

SIX months since we penned some remarks upon the interesting features which presented themselves to the scientific mind when up in a balloon.\* We then observed that in a very short space of time anyone who had not been up in a balloon would be regarded as one behind his time, and would regarded as one behind his time, and would be placed in the same category as those who had never ridden in a Hansom cab, nor travelled on a railway. The time to which we then looked forward has arrived, and it is now open to any one who likes to take boat, 'bus, or rail to Chelsea, to make an ascent in one of the finest and best appointed balloons that ever floated in the air. This splendid aerostat is the property of M. Giffard, the inventor of the well-known injector, and by whom it was constructed. It is now on view in the Ashburnham Park, Chelsea, where it is daily making captive ascents—weather permitting. In one of these ascents we had the pleasure of joining yesterday week, on the invitation of the proprietor, and which ascent we briefly recorded in our last number. On that occasion, Mr. Glaisher made the ascent with the view of taking some meteorological observations near the earth, which the gradual ascent of a captive balloon would permit of, and which he had not been able to take in a free balloon, owing to the rapidity with which it always left the earth. On that occasion, too, there were present Lord Richard Grosvenor and Lord Dufferin, members of the council of the Aeronautical Society of Great Britain, Mr. Brearey (the secretary), Mr. T. Cargill, C.E., and several other scientific gentlemen. But the elements were unpropitious; a stiff breeze suddenly sprang up, which obliged the party to return to earth after an altitude of about 2,000ft. had been reached. The circumstance, however, served to show how perfect all the arrangements were, and how thoroughly under control the immense machine was. As we made the ascent shortly before going to press, we had not time to place the details of the apparatus before our readers; we, however, propose to do so now.

Those who visited Paris during the last Great Exhibition will, doubtless, remember M. Giffard's captive balloon, and the machinery by which the ascents and descents were regulated. This machinery has now been brought to London, together with a balloon 23ft. larger in diameter than the Paris balloon, and a rope of much greater length. On entering the Ashburnham Park, the visitor finds himself in a circus 246ft. in the visitor finds himself in a circus 246ft. in diameter, encircled by a screen of timber framing, 80ft. in height, and covered with canvas. In the centre of this arena is a well about 15ft. deep, over which the balloon, when not on a journey, is held in place by numerous guy ropes. This balloon is 93ft. in diameter, and when inflated contains 421,161 cubic feet of gas, pure hydrogen being the gas used. The material of which the balloon is constructed is composed of one layer of linen interior, united to another the balloon is constructed is composed of one layer of linen interior, united to another layer of the same material, by means of a solution of india-rubber. Outside this is a layer of Cretonne linen, the attachment being formed by a vulcanized india-rubber composition. The exterior is finished with two coats of gum shellac varnish, over which again are laid fine coats of boiled linseed oil. From the balloon is suspended a circular car, having the centre open for the passage of the rope, which is attached directly to the body of the balloon. The car will accommodate about twenty-five persons; this was, in fact,

the number that made the ascent to which we have referred. The rope is made fast to a pressure gauge, having a horizontal dial, upon which a pointer indicates the strain put upon the rope at any moment. The balloon weighs 6,000lb.; the core netting, with which it is covered, and the necessary guy ropes, &c., which are very numerous, are stated to weigh 4,000lb.

The main rope by which the balloon is held captive, weighs 4,350lb., is 2,150ft in length, and is 23in. in diameter at the end next the balloon, gradually tapering to 2in. diameter at the end next the winding drum. The object of thus tapering the rope, is that its weakest part may be nearest the ground, at which point it would first give way, if it broke at all—which is hardly probable. By this means, if such an event did take place, there would be no danger to those below, from a heavy mass of rope falling upon them. It would also act somewhat as a brake upon the balloon, which would otherwise shoot upwards at a terrific rate, when suddenly relieved of its load. The rope passes from the balloon over a pulley wheel 5ft. 6in. in diameter, which is so arranged that it allows the rope to pass freely over it, no matter what angle it may take. It is, in fact, swivelled horizontally and vertically, and has a heavy counterbalance weight attached to it. This pulley wheel is held down by a strong framework, which is built into the earth, and is weighted with 50 tons of brick iron and timberwork. which is built into the earth, and is weighted with 50 tons of brick, iron, and timberwork. The rope passes horizontally from the pulley along a gradually widening tunnel to the winding drum which is placed at the far side of the circus. This drum is 23ft in length and 7ft. in diameter. It is cast in lengths, and is grooved to receive the rope. The drum is is grooved to receive the rope. The drum is surrounded by a platform, at each end of which is a double-cylinder steam engine of horizontal construction. These engines drive the drum by means of toothed gearing; they receive steam from two vertical boilers placed in the rear of the circus. The boilers are of French construction, by M. Duresnes, as are also the engines, which are by M. H. Flaud. The winding drum was made in London by M. Babeaud, the engineer in charge of the balloon machinery.

On a piece of spare ground in the rear of the circus is the apparatus for producing the gas. This consists of a series of wooden vats in which scrap iron is placed in a solution of sulphuric acid. The gas is drawn off to a receiver, and is made to pass through a washer and a purifier, after which it is stored in a gas holder ready for use. The balloon is always kept inflated, but there is always a loss going on from condensation, the deficiency being made good every evening. The cost of the balloon and apparatus has been something considerable, as will be seen from the following items:
—Cost of balloon, £2,000; netting, guy, and
other necessary ropes, £2,000; main holding
rope, £220; engines, boilers, and machinery to work the balloon, £4,000; gas works, £1,200. These items—which are not all that could be enumerated—represent the respectable sum of £9,420, and when we add that the gas for one inflation costs £600, it will be seen that M. Giffard has made an investment of no light nature, but which we trust will prove as satisfactory to himself as his balloon will prove attractive to the public. A careful examination of the whole apparatus has satisexamination of the whole apparatus has satisfied us that everything is as safe as human ingenuity and foresight can make it. Two experienced aeronauts, MM. Godard and Aymo, accompany each ascent, whilst the manager is M. Yon, who manufactured the whole of the ropes and netting, and also constructed the balloon for M. Giffard. We can but wish success to this novel enterprise, which we are sure will be well patronized by

THE MARTINI-HENRY RIFLE.

RUMOURS of a peculiar character are at present rife as to the intentions of the Government with respect to the Martini-Henry rifle. This is especially the case on the Continent, where the idea prevails, in some quarters, that the Government are now hesitating about the adoption of this rifle as the service arm, and may possibly, after all, abandon it altogether. There is no positive foundation for such a supposition, and the only negative one we can discover is that the Estimates did not include extravagant votes for this arm. It may, therefore, be as well briefly to place before our readers the present position of matters, which we are enabled to do from personal observation and knowledge of the circumstances. The hands at the Government works at Enfield are now engaged in finishing the last order for 35,000 Snider rifles, which order will be completed by September next. These arms are required for the service, and their completion will use up a quantity of material already prepared for them. When these rifles are out of hand, the manufacture of the Martini-Henry gun will be commenced, and be proceeded with until a sufficient number are turned out to enable the arm to have a fair practical trial. After this has been made, and the arm reported to be satisfactory, the manufacture will be con-tinued at the Government works, besides which, contracts will be entered into with private manufacturers to supply the weapon. The machinery at Enfield will require very The machinery at Enfield will require very little alteration, and, besides cutters and other tools, there will scarcely be any new machinery. By the end of the year the officials at Enfield expect to be turning out about a thousand rifles per week. Such is the present position of our future military arm, and we trust this simple statement may allay the hopes and fears which we have heard expressed of late both at home and abroad.

# ELECTRICAL BALANCE THERMOME-TER FOR MEASURING TEMPERA-TURE OF DEEP SEA.

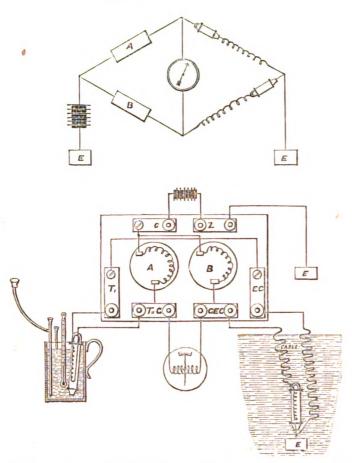
NHE system of measuring temperature by variation in the resistance of metals to the passage of the electric current arising from changes in temperature was first applied by Mr. C. W. Siemens, F.R.S., in 1860, during the manufacture of the Malta and Alexandria Government cable at Greenwich. A certain portion of the cable in one of the tanks was found to give results of insulation and resistance of the copper conductor that could be only due to a far higher state of temperature than was apparent by the thermometer. On a careful examination, it was found that a large amount of the coil exhibited symptoms of spontaneous heating. It is not our intention to refer to the causes which produced this effect, but simply to show how the variations in the resistance of the copper conductor enabled this extra heat to be at once observed. In order to avoid the recurrence of this spontaneous heating in the coil, certain instruments, which may be termed "resistance thermometers," based upon the principle that the resistance of copper wire varies in a constant ratio with the temperature, were constructed and placed at regular intervals between the coils. These at regular intervals between the coils. instruments consisted of several layers of insulated wire of a known resistance (at a standard temperature), protected by an iron core. By connecting any of these "thermometers" with the testing apparatus, any variation in their resistance, as compared with the original standard, would immediately denote a change of temperature, and the temperature itself, calculated from known the public, whenever the weather will permit temperature itself, calculated from known of ascents being made. There is now no excuse for the public not enjoying the privilege of a balloon ascent, which luxury has hitherto only been allowed to a select few.

\* MECHANICS' MAGAZINE, November 6, 1868.

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#### THERMOMETER. BALANCE ELECTRICAL

BY MR. C. W. SIEMENS.



fitted out for deep sea soundings, and the general want of success attending the experiments relative to the determination of the sea temperature at extreme depths, have caused Mr. Siemens' attention to be brought to the subject, and he has so far improved the original "resistance thermometer" for this special purpose as to make it now one of our most valuable assistants in penetrating the hidden mysteries of the deep sea.

At the late soirée of the Royal Society, the improved form of "balance thermometer" was exhibited, and obtained a large share of attention. A set of similar apparatus has been supplied to Dr. Carpenter, who proceeds (in the "Porcupine") on a surveying expedition in the North Atlantic. The apparatus tion in the North Atlantic. The apparatu altogether consists of the following parts, the resistance thermometer and sounding line to which it is attached, and electrical bridge and balance thermometer. The resistance thermometer consists of a coil of fine iron wire, silk covered, of a total resistance of 500 B.A. units. This is contained in an inner tube of metal, the whole of which is dipped into melted paraffin wax, so that per-fect insulation is obtained. The inner tube containing the "resistance wire" is enclosed in an outer tube, perforated with holes, so as to allow the free passage of water. The sounding line is, of course, any length required; and it may be remarked that the maximum length is all that is required. No cutting or shifting for shorter lengths. The cutting or shifting for shorter lengths. facility of using the line for a cast in 100 fathoms for 1,000 fathoms is the same. This line contains two gutta-percha insulated copper wires of equal length and resistance, served with the best hemp, and sheathed externally with copper bands; so that the line—of no great thickness, but great strength -presents a smooth and even exterior. One of these wires terminates at the bottom, and is connected on to the outside of the line, a good connection being made round the copper. The second wire is connected to one end of

the "resistance thermometer," the other or lower end of which is brought out and connected to the copper sheathing at the same point that the first line is connected to. The reason of this will be shown directly.

The electrical bridge and balance thermometer are the instruments used on board the vessel to measure the temperature indicated by the "resistance thermometer," just described. The bridge is that known as Wheatstone's bridge, or parallelogram, and is the favourite electrical instrument in use for the measurement of resistances. upper figure shows the theoretical arrangement. The battery is connected at one end to the arms A B, and the electric current divides and passes through the two arms, and through the two arms at the opposite extremities to earth (E). Exactly in the middle, joining these arms together, is a galvanometer. At the points A and B are placed two equal resistances, or two resistances bearing a known ratio to each other. In the two other arms are placed—in one, a set of standard resistances; and in the other, the resistance to be measured. So long as the resistances in the arms bear the same ratio to each other, the tensions of the battery at galvanometer connections are equal, and no deflection is observed in the galvanometer; the same ratio, then the galvanometer; the same ratio, then the galvanometer is deflected to one side or the other. When the resistances A and B are equal, and the resistance in the third arm is altered until no current passes through the galvanometer. current passes through the galvanometer, then we know that the resistance thus altered is exactly equal to the fourth arm.

The system in this special bridge for the resistance thermometer is the same in principle, but the peculiar difference consists in altering the resistances. The second diagram will explain the connections. The battery is

ances, where the battery current divides equally, one half passing through A, the other through B. The ends of A B pass to the plates  $T_{\rm II}$  and G; at the terminals G G the the plates  $T_{11}$  and G; at the terminals G G the galvanometer is inserted. From G E C the current passes (down the one arm) through one of the wires of the sounding line to the resistance thermometer and to earth on the line; the other half of the current passes (down the other arm) from  $T_{11}$  to a balance thermometer, placed in a specially fitted vessel, provided with two tubes, and immersed in water. After passing through the thermoin water. After passing through the thermometer, the current passes round by the earth connection (E C) to the second wire in the sounding line, and makes earth at the bottom of the line, in the same place that the other thermometer makes its earth connection. These two thermometers are constructed precisely alike, so that if they were placed in the same water, having a perfectly uniform temperature, no deviation of the galvanometer needle would be observed. The modus operandi may be briefly stated. The resistance thermometer, with line attached (the other ends being to their proper connections on the bridge), is dropped overboard. A change of temperature at once takes place; the resistance of the iron, as the water gets cooler, decreases rapidly. On connecting the cooler, decreases rapidly. On connecting the battery by a key to the bridge, the needle is at once deflected, showing the change. An alteration is made in the resistance of the balance thermometer by cooling the water, until the needle is brought to zero; and as alteration occurs after alteration, so the water of the vessel has to be cooled, the object being to keep the needle as near as possible to zero. A delicate thermometer is kept immersed in the water, so that every change, however slight, is noted. The beauty of the balance arrangement is that the variations of temperature throughout the descent of the line can be noted. The tubes in the vessel are—one for admitting the cooling mixture to the bottom, and the other for blowing in, so that the water is at once rendered of a tem-perature quite uniform. The sensitiveness perature quite uniform. The sensitiveness of these thermometers is so great that a variation of one-tenth of a degree Fah. can be observed. The electrical apparatus is so simple, and so devoid of anything requiring arrangement or adjustment, that a perfect novice can manage it. A further improve-ment has just been made to it by the substitution of a small magneto-electric machine, provided with a Siemens' armature. does away with the necessity of looking to the battery, and renders any derangement less unlikely.

It is possible that an objection might be made to the copper sheathed line instead of an ordinary deep sea line; but the copper sheathed line has an advantage over the ordinary line, in giving very little resistance in water. From experiments tried, it will go down to a depth of 2,000 fathoms in threequarters of an hour, instead of about two hours with the old line. In raising the line, the advantage is still more in favour of the copper sheathed line.

The special advantages of this method electrically, are-the excellence of the earth connections, there being no polarization; the effect of the leading wires is entirely eliminated; the ratio of increase of electrical resistance by increase of temperature is rendered immaterial; no calculation is required; where the temperature to be ascertained is higher than that in the vessel containing the "balance thermometer," the process is similar, only warm instead of cold water has to be introduced. Amongst the applications of this instrument may be mentioned its adaptability for medical purposes—it can be made as small as a pencil case
—and for breweries, where the temperature of each vat could be measured from the officeconnected with the plates C and Z, the latter a fact worthy of notice, when it is to be co of which is to earth (E). From C the connection passes to A and B, two equal resist- upon the temperature during fermentation. a fact worthy of notice, when it is to be considered that the quality of beer depends greatly

### THE ROYAL INSTITUTION.

O<sup>N</sup> Thursday, May 6, Professor Tyndall, in his fifth lecture upon "Light," exhibited a magic lantern arrangement, whereby it is possible to throw a very fair spectrum upon a screen. It consisted of a piece of wood, with a vertical slit cut through it, which was inserted in the place of a slide in the lantern, so that, when a bisulphide of carbon prism was placed close in front of the object glass, the image of the slit was de-flected, and transformed into a spectrum. The ordinary oil light, or even a candle, may be used in the lantern, and many experiments may be shown by this arrangement, though the spectra from such sources of light are necessarily always very deficient in chemical rays. Dr. Tyndall next illuminated a tall glass jar of pure water with the electric light, and poured some strong solution of sulphate of quinine in tartaric acid into the liquid, the result being that those who observed the jar by reflected light saw a beautiful blue cloud descending in the water, caused by the lowerextra violet rays in the electric light. In reality, there was no cloud, for to those in the rear of the liquid, who viewed it by transmitted light, the water remained per-fectly transparent. The lecturer explained that the ultra-violet rays in the electric light came more from the non-luminous space between the carbon points than from the intensely luminous points themselves. The distance of the points from each other makes very little difference in the brilliancy of the visible spectrum, but a very considerable difference in the quantity of extra-violet rays thrown upon the screen, as proved by the intensity of the fluorescence exhibited by paper washed in sulphate of quinine, and held in that part of the spectrum. Professor Tyndall also exhibited some experiments to illustrate phosphorescence, which it is believed differs only from fluorescence in the fact that the molecular disturbance set up by light, lasts some little time after the exciting cause is removed.

The lecturer then entered into the principles of spectrum analysis. When the light from a white-hot solid body is spread out as a spectrum, that spectrum is continuous, displaying all the colours of the rainbow, melting gradually into each other. When the light comes from a substance raised to the condition of gas or vapour, bright coloured lines, characteristic of the chemical substance used, fall upon the screen. Lastly, when the light originates with a white-hot mass, surrounded by a vapourous envelope, the continuous spectrum is cut here and there by dark lines, characteristic of the substances forming the vapours. The light of the sun gives a spectrum of the last description, from which fact it is known that the light of the sun originates with white-hot solid or liquid matter, surrounded by an atmosphere of vapours of chemical substances common upon the earth. Professor Tyndall said that from the dark bands of the spectrum we can determine what substances enter into the composition of the solar atmosphere. One One example will illustrate the possibility of this. Let the light from the sun and the light from incandescent sodium vapour pass side by side through the same slit and be decomposed by the same prism. The solar light will produce its spectrum, and the sodium light its yellow band. This yellow band will coincide exactly in position with a characteristic dark band of the solar spectrum, which Fraunhofer dis-tinguishes by the letter D. Were the solar tinguishes by the letter D. Were the solar nucleus absent, and did the vapourous photosphere alone emit light, the dark line D would be a bright one. Its character and position prove it to be the light emitted by This metal, therefore, is contained nosphere of the sun. The result is in the atmosphere of the sun. The result is still more convincing when a metal which gives a numerous series of bright bands finds a lecture upon his system of working artillery,

each of its bands exactly coincident with a dark band of the solar spectrum. By this method, Kirchhoff, to whom we owe, in all its completeness, this splendid generalization, established the existence of iron, calcium, magnesium, sodium, chromium, and other metals in the solar atmosphere; and Mr. Huggins has extended the application of the method to the light of the planets, fixed stars, and nebulæ.

The light reflected from the moon and planets is solar light, and, if unaffected by the planet's atmosphere, the spectrum of the planet would show the same lines as the solar spectrum. The light of the moon shows no other lines. There is no evidence of an atmosphere round the moon. The lines in the spectrum of Jupiter indicate a powerful absorption by the atmosphere of this planet. The atmo-sphere of Jupiter contains some of the gases or vapours present in the earth's atmosphere. Feeble lines, some of them identical with those of Jupiter, occur in the spectrum of Saturn. The lines characterizing the atmospheres of Jupiter and Saturn are not present in the spectrum of Mars. blue portion of the spectrum is mainly the seat of absorption, and this, by giving predominance to the red rays, may be the cause of the red colour of Mars. All the stronger lines of the solar spectrum are found in the spectrum of Venus, but no additional lines. As regards stellar chemistry, the atmo-sphere of the star Aldebaran contains hydro-

gen, sodium, magnesium, calcium, iron. bismuth, tellurium, antimony, mercury. atmosphere of the star Alpha in Orion contains sodium, magnesium, calcium, iron, and bismuth. No star sufficiently bright to give a spectrum has been observed to be without lines. Star differs from star only in the grouping and arrangement of the numerous fine lines by which their spectra are crossed.

The dark absorption lines are strongest in the spectra of yellow and red stars. In white stars the lines, though equally numerous, are very poor and faint. A comparison of the spectra of stars of different colours suggests that the colours of the stars may be due to the action of their atmospheres. Those constituents of the white light of the star on which the lines of absorption fall thickest are subdued, the star being tinted by the residual colour. Turning from the stars to the nebulæ, some nebulæ give spectra of bright bands; others give continuous spectra. The light from the former emanates from intensely heated matter existing in a state of gas. This may in part account for the weakness of the light of these nebulæ. It is probable that two of the constituents of the gaseous nebulæ are hydrogen and nitrogen.

At one time it was possible to examine the At one time it was possible to examine the rose-coloured solar prominences only during an eclipse, but Mr. Janssen in India, and Mr. Lockyer subsequently, but independently, in England, proved that the bright bands of the prominences might be seen without the aid of a total eclipse. By sending the black which the series and eclipse in the light tending the series of the prominences. ing the light, which, under ordinary circumstances, masks the hydrogen bands, through a sufficient number of prisms, it may be dis-persed, and thereby enfeebled in any required degree. When sufficiently enfeebled, the undispersed light of the incandescent hydrogen dominates over that of the continuous spectrum. By going completely round the periphery of the sun, Mr. Lockyer found this hydrogen atmosphere everywhere present, its depth (generally about 5,000 miles), being indicated by the length of its characteristic bright lines. Where the hydrogen ocean is shallow the bright bands are short, where the prominences rise like vast waves above the level of the ocean the bright lines are long. The prominences sometimes reach a height of 70,000 miles. Professor Tyndall closed this interesting lecture by explaining the

by utilizing the force of the recoil of the gun to lower the gun below the parapet for loading, and by means of a counterbalancing weight to raise it again for firing. Thus a large lateral range is commanded, and the large lateral range is commanded, and the necessity for embrasures in the fortifications is avoided. The system has already been described in detail in these columns. On the following day, May 8, Professor Seeley, the reputed author of "Ecce Homo," gave the first of three lectures upon Roman history, and entered fully into the subject of the constitution and addition of the Pompa continuous and the pompa continuous an stitution and condition of the Roman empire in the time of Cæsar. On Tuesday, May 11, as well as on the previous Tuesday, Professor R. Grant, F.R.S., continued his lectures upon stellar astronomy. He explained in detail all the difficulties in the way of measuring the motions and distances of the fixed stars, and how those difficulties have been overcome.

# NOTICES OF BOOKS.

WHEN Mr. Fairbairn gave the profession a second edition of his treatise on iron and steel manufacture, he predicted that great changes would, at no great distance of time, occur in that department of industrial art, and which would result in the production of a superior article. These changes have, to a great extent, occurred, and have necessitated another edition of Mr. Fairbairn's most useful work, which now lies before us.\* The verification of this prediction has been chiefly accomplished by the extension of the Bessemer process, and the gradual introduction of the homogeneous system into the manufacture of metals. Mr. Fairbairn describes all the new improvements, including the Heaton process, which, by the introduction of the crude nitrate of soda, results in the production of "steel-iron" from any kind of pig iron. This method of manufacture is described in a chapter which embodies the improvements in the manufacture of iron and steel from 1864 down to the present time. The work is fully illustrated, and contains some valuable information upon the properties of the materials of which it treats.

During last year, a series of very interesting articles upon the industries of Scotland appeared in the weekly issue of the "Scotsman." These articles were fair and accurate accounts of the various branches of trade, and we are now glad to see them collected together and reproduced in a more permanent form. † The volume in question is a history of the rise, progress, and present condition of the Scottish industries, especially of those which, by their extent or peculiarity, merit notice. Mr. Bremner judiciously confines himself to a plain narrative of facts, which have been carefully selected, and are interspersed with here and there a few general reflections. Iron works, coal mines, shipbuilding establishments, railway works, linen and cotton works, Many scenes of labour are depicted, which are only known to most of our readers by name. In Mr. Bremner's book, our friends will find entertainment and instruction admirably combined, whilst as a book of reference upon the Scottish industries, it will for some time remain an authority.

Weale's rudimentary series continues to receive fresh accessions of useful information. No. 163 of the series is a legal exposition of the patent law,; which conveys reliable information upon this part of the subject. It sets forth the state of the law, resulting from decisions more recent than those ni any other work, and will prove useful in this respect to all engaged in the work of patenting inven-tions. The author has added some explana-

<sup>\*&</sup>quot;Iron: its History, Properties and Processes of Manufacture." By William Fairbairn, C.E., F.R.S., &c. &c. Third Edition, revised and enlarged. Edinburgh: ADAM and CHARLES BLACK. 1869.

"The Industries of Scotland." By David Bremner. Edinburgh: ADAM and CHARLES BLACK, 1869.

"Law of Patents for Inventions." By F. W. CAMPIN, Barrister-at-Law. London: VIRTUE and Co., 26, Ivy-lane, Paternoster-row. 1869.

tory notes on the law as to the protection of He effects this by directing the current of

designs and trade marks.

Mr. David Page, who has contributed largely to geological literature, has recently given the science-seeking public yet another boon in his "Chips and Chapters on Geology."\* The present volume is intended for those who, having neither need nor time for a systematic course of study, still wish to make themselves familiar with the more prominent facts and bearings of geology. The author places before his readers a collection of mis-The author cellaneous matter relating to the subject, which he has selected with a view to instruction in the general principles of this science. has so modified and arranged the whole, that we have a very attractive volume, which is alike fitted for the young geologist, as well as for those readers who do not wish to dive deeply into this attractive science.

We have now got half way through Mr.

Bourne's work on modern engines, Parts XI. and XII. being now to hand. In these, as in those which have preceded them, there is no lack of interest. After pointing out the probable course of improvement in locomotives, the author gives a condensed account or recapitulation of the principal classes of improvements in the steam engine, which have been propounded at various times in its history. These are arranged chronologically, dates and the numbers of patents—where patents have been obtained—being given. Thus, independently of the practical observations of the author, we have a very complete index of the subject, which, of itself, will prove of great value to many designers and improvers of steam engines. A large folding plate of Captain Ericsson's original "Monitor," showing the screw and turret machinery, accompanies Part XI., whilst Part XII. has two plates, giving the details of surface-condensing engines, by Messrs. Richardson.

Mr. Burgh's treatise on screw propulsion, which was to have been completed in fifteen parts, has been extended to sixteen. This extension has been decided upon in order that the work may embody some very recent important matter on screw propellers, which has been exclusively given to the author by our leading marine engineers. The author has thus exercised a wise discretion in thus extending his work, and to which none of his readers will object. Parts XIII., XIV. and XV. of this treatise are now before us; they are chapters on a new principle of the screw propeller, by Mr. Arthur Rigg, who has made some very interesting experiments with the screw, the results of which he here embodies. Mr. W. Langdon supplies a chapter on thrust blocks, and Mr. Burgh follows with another on the same subject. In Chapter XX., Mr. Burgh reviews comparatively the whole family of modern screw propellers as constructed by our principal marine engineers. In the succeeding chapter, Mr. Burgh gathers into a focus the opinions and ideas of all the engineers who have contributed to his treatise. In this chapter the last page of Part XV. finds us. The illustrations of these three numbers consist of lifting frames for the screw propeller; the feathering screw of the "Aurora"; and the details of the methods of screw propulsion adopted in various other vessels.

Mr. C. J. Richardson, whose name is intimately associated with the liquid fuel question, has been busying himself of late with the smoke nuisance, and has given us a pamphlet on the subject (Atchley and Co., Great Russell-street). Mr. Richardson proposes the cold water cure for this domestic evil; his remedy is to pass the smoke through a water spray.

• "Chips and Chapters: a Book for Amateur and Young Geologists." By DAVID PAGE, F.R.S.E., F.G.S., &c. WILLIAM BLACKWOOD and SONS, Edinburgh and London. 1869.

† "Examples of Modern Steam. Air, and Gas Engines." By JOHN BOURNE, C.E. London: LONGMANS, GREEN, BRADEE, and DYEE, Paternoster-row.

‡ "Modern Screw Propulsion." By N. P. Burgh, engineer, London: E. and F. N. SPON, 48, Charing-cross.

smoke over a bridge just beyond which a jet of water acts on it. The soot and water are of water acts on it. carried down another flue to a pipe leading to the outside of the house, and thence to the The idea is certainly an ingenious sewer. one, and has proved effective in experiment. But how about the noxious gases ascending from the sewer, Mr. Richardson?

Mr. J. Conyers Morrell is the patentee of an apparatus for carrying out the dry ash sanitary scheme, of which he is a strong advocate. He read a paper on the subject, two months since, at Manchester, and which he has now published in pamphlet form (Powlson, Bow-street, Manchester). As may be supposed, the author proves that his system is the system for reducing the high death rate. Mr. Morrell states that irrigation cannot as yet claim to be a successful means of disposing of sewage matter, and thus of reducing the high death rate. Mr. Morrell is probably not aware of what Mr. Baldw n Latham has done for Croydon. He has half ruined the under-

Messrs. Cassell, Petter, and Galpin, have just issued two more of their useful primary series of elementary text books. The first of these is on human physiology, and contains one hundred questions for examination. It is written by Mr. Ellis A. Davidson, who has written other works of the same series. The other work is an elementary history of Great Britain, written by the Rev. W. E. Little-wood, M.A. This enterprising firm have also issued the second parts of each of the following of their popular drawing copies:-Series A, floral and vegetable forms; B, model drawing; C, landscape drawing; and D, figure drawing. The studies are well selected, and are calculated to rapidly advance the careful student. Each of these series is to be

completed in twelve parts.

Four pamphlets and a trade price book complete our list of books to the present time. The first of these pamphlets is on fluid resistance to uniform velocity and the relative values of power, form, volume, and velocity, in designing steam and sailing ships; also steam, sailing, and wager boats. It is by Mr. George Sole, N.A. (Trübner), and was written for the purpose of being read as a professional paper in a public institution. Failing this, the author has published it in the hope of its proving of general utility. Its contents are worthy the consideration of naval architects; they tend to prove that the velocity may be known by an estimated calculation as truly as any other engineering matter. The second pamphlet is on London water supply, by Mr. II. H. Fulton (Stanford, Charing Cross). It gives an outline of Mr. Fulton's proposed method of supplying London with water from the source of the river Wye in North Wales. The third pamphlet is on polar magnetism-its astronomical origin, its period of revolution, and the synodical period of the earth identical. It is a lecture delivered by Mr. John A. Parker before the American Geographical and Statistical Society (Trübner). The author distical Society (Trübner). The author disagrees with astronomers on various points, especially upon the subject of the precession of the equinox. Our fourth pamphlet is a contribution to the literature of perpetual motion, by Mr. John C. Gardner (Yates, Chancery-lane), who claims to have practically solved the grand secret. The price-book is that of the Wardour (Chilmark) and Tisbury Stone Company, and, like most books of its class in the present day, it contains some useful hints upon the subject of which it treats.

OTES ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL APPLICATIONS.

PRESERVATION OF MEAT BY COLD.

THE effect of a low temperature in preventing the putrefaction of animal substances is no

historic mammoth was found in Siberia buried in snow, where it must have lain for ages and ages, and yet was fresh enough to furnish food for the dogs that assisted in disinterring it, and even before then, men's mind have been occasionally turned to the preservation of meat by means of cold. But now the preservation of meat in a fresh state becomes every day a matter of greater and greater importance. Our country is unable to afford us sufficient animal food for our population. Our imports of live cattle are necessarily restricted; and, unfortunately, we are too liable to import cattle diseases with cattle. From one cause and the other, our imports have no effect in reducing the price of meat; and the consequence is that our labouring population is greatly underfed, more especially the agricultural part. It is stated, and, no doubt, with truth, that, in many counties, only the heads of families eat meat, and they not oftener than once or twice a week. Under these circumstances, any plan for the importation of fresh meat from distant parts of the world deserves serious consideration. Mr. Julius Jeffreys, F.R.S., has just propounded a plan by which, as he says, under the protection of deep congelation, large cargoes of fresh meat may be imported from Australia and South America, at a cost, exclusive of freight, of about a farthing a pound. The man who really succeeds in doing this will be one of the greatest benefactors of the age, and we sincerely hope that Mr. Jeffreys' plan will succeed. Without attempting to give a description of the somewhat complicated apparatus which the inventor proposes to employ, we may say, in a few words, that the joints of meat, covered with extract of meat to keep out air, are packed in boxes provided with thin metallic sides—that is, a good conducting medium—and these boxes are exposed to a current of air, reduced to a very low temperature by the application of ether spray. In this way, the meat is frozen into a solid block, and in this state is delivered into the hold of the ship, where, by the continued application of cold air, it is kept frozen during the voyage. We do not understand that Mr. Jeffreys' apparatus has been put into actual operation. The theory of the process is perfect and of its success we have not much doubt, but the success requires to be demonstrated; and we hope some of the wealthy men who listened to the explanation of the process will assist the inventor in carrying out his schome.

We have said that we have little doubt of the success of the plan, but there is this much to be said against it. Although it is quite true that meat kept in ice does not undergo actual putrefaction, some incipient changes do undoubtedly take place: the meat loses much of its flavour, and, when it is thawed, it very rapidly begins to putrefy. Mr. Jeffreys proposed to arrive at a temperature considerably below the freezing point of water, and, by this means, he conjectures that he will be able to oppose a solid mechanical obstacle to any movement of molecules, and so prevent the incipient change of which we have spoken. We should add also that it is one peculiarity of his process to thaw the meat very gradually when it is delivered for consumption, and this may prevent the rapid putrefaction which sets up when it is quickly thawed. Everyone who wishes to see our popula-tion well fed and nourished for physical and mental exertion, must desire to see some such plan as this perfected. Preserved meats, as we ordinarily get them, are not—and never will be—popular with the working class, who, as a rule, are more particular about their food (especially skilled artizans) than any other class. The meat must be fresh, and the joints must be well formed; and if such can be supplied from the enormous resources of the Southern hemisphere, now mainly wasted, at a very moderate cost, an immense benefit will be conferred on society, and proportionate profits will accrue to those engaged in the supply.

# PARLIAMENTARY NOTES.

VELOCIPEDES are beginning to occupy the attention of Parliament, for we find Mr. Hambro asking the Postmaster-General last Thursday evening if it was a fact that in certain parts of Wales the post-office mails were now conveyed on velocipedes instead of on horses; and if this change had been found to add to the efficiency and ecorecent discovery in science. Ever since that nomy of the service. The Marquis of Hartington



replied that no such change as that was at present contemplated. The experiment had been made, or would shortly be made, of allowing rural post messengers in certain districts to use those machines on roads which were not very hilly, but as the practice of riding or driving on bicycles had not come under examination by the Civil Service Commissioners, the use of them must, for the present, at least, remain optional.

On the same sitting, Mr. Armistead asked what means those seamen of the mercantile marine who might have claims upon the Greenwich Hospital Fund had adopted to obtain their share of the £4,000 set apart by the Government for their benefit. Mr. Childers said that the allotment of the £4,000 to the seamen of the mercantile marine had only been proposed by the Government in the Greenwich Hospital Bill, and until that measure became law those seamen would have no means of claiming any part of the fund. When the bill passed, the Admiralty would communicate with the Board of Trade for the purpose of seeing that the alterations were properly made.

In answer to a question from Mr. L. King as to the

In answer to a question from Mr. L. King as to the cost of St. Stephen's Crypt and its probable uses, Mr. Layard said that a sum of £1,953 altogether had been expended, including embellishments and fittings; he believed £830 on embellishments and the rest on fittings. The works were commenced in 1853, they were authorised by his two predecessors, and the cost was met by a vote of the House. The crypt and the baptistry were at present complete and ready for use, by members, if required. It was for the House, not for him, to determine to what purpose the crypt should be applied. He believed the intention of the architect was that it should be employed as a place of worship for the numerous residents in that palace.

# ON LIGHTHOUSES AND LANTERNS.\* By Mr. D. M. HENDERSON.

THE glass used in lighthouse apparatus was nearly all made at Saint-Gobain or Birmingham, and was of the kind known by the name of crown glass. Different mixtures had been employed for the purpose; but M. Reynaud, the Director of the French lighthouse service, now gave the composition as—

Alumir	18.	and	10	xide	0	fir	or	1		•	t	races.
Lime						· •		•		٠		15.7
Soda .									-		•	12.2
Silica												72.1

At Birmingham various mixtured had been tried, of which several examples were given, the following being about an average:—

		_	cwt.	qrs.	lbs.
French sand .			5	0	0
Carbonate of soda			1	8	7
Lime			0	2	7
Nitrate of sods			0	1	0
Argenia			Ò	Ā	Q

English glass was supposed to be of the refractive index of 1.51. That produced at Saint-Gobain had formerly an index of refraction as low as 1.50, but now it was 1.54, and frequent experiments were made to ascertain that the standard was maintained.

The furnace for melting glass was generally rectangular in plan, and was constructed of the most refractoy materials: and the sides were arranged so as to allow of the easy withdrawal of the pots. Six, and sometimes eight, pots were placed in the furnace, arranged in pairs with a firegrate at each end. The flame filled the whole interior of the furnace, and, after circulating round the pots, which were covered to prevent the colour of the glass being injured by dust, or impurities from the coal, found its exit by flues. Great care was necessary in the preparation of the pots, which were made of about one-half new fireclay, and one-half old potsherds finely ground. The length of time a pot would last depended upon (1) the quality of its manufacture; (2) its being slowly and thoroughly dried—a process occupying about six months; and (3) the care bestowed upon it in the furnace, and whilst withdrawn for casting. The average number of castings from each pot was about twenty; and the time the pot was out of the furnace at each casting was about three minutes. It was mentioned that Mr. Siemens' regenerative furnaces were now in use for the manufacture of

lighthouse glass with perfect success. When the metal was ready for casting, each pot was lifted from its seat, withdrawn from the furnace, and carried to the foot of a crane, the lifting chain of which had attached to its end a clip to embrace the pot. A mouth-piece of wrought iron was fitted to the pot before casting, to facilitate the pouring, and the workmen tipped over the pot by means of long handles.

The casting table was circular, and was mounted on a frame, so that by means of a handle it could be turned round, and each part of its outer circumference brought consecutively under the pot of molten metal. The moulds into which the glass was to be cast were arranged round the outside of this table, and were caused to revolve slowly under the continuous stream of liquid glass flowing from the melting pot, so that each mould was filled in succession, thereby enabling the immediate return of the empty pot to the furnace. The moulds were of cast iron, of a uniform thickness of §in., and were supported on feet cast on, the size being such as to allow §in. thickness of glass all round for the grinding process. The small lens-rings and prisms were cast in one piece, but the larger ones were cast in segments. The large belts, or central lenses for fixed lights, were generally cast flat, and were afterwards bent on a saddle to the required curve in a kiln.

Sand, emery, rouge and water were the four necessaries for glass grinding and polishing. The sand had to be applied with abundance of water, until it lost its cutting qualities. The emery, after being ground to a fine powder, was agitated in water, and the mixture was passed through a series of vats or tubs, so that the emery was divided into as many qualities as there were tubs, the coarsest being deposited in the first tub, the finest in that furthest from the supply. The rouge, which was an oxide of iron, was prepared from the sulphate, and was separated into qualities by means of water tubs, as in the case of the emery. The glass of optical apparatus was ground on horizontal circular tables, securely fastened to the tops of wrought-iron vertical spindles, which received motion from the main shafting in various ways. The surfaces of these tables were divided out, like the face plate of a lathe, to receive the different sizes of "carriers," or supports of cast iron, which were bolted to them, and were arranged to hold the lenses or prisms to be ground. Plaster of Paris was then laid on the "carriers" in bands, the bands being reduced to the exact size by turning the table round under a gauge secured to the framing of the machine. The glass was laid on these strips, and was secured in place by means of pitch, care being taken, in the larger sizes, which were ground in segments, to place a thick ness of pitch between each joint, so that glass did not touch glass. A detailed account was given of the method of grinding a belt, or central lens, of a fixed light, and also of grinding a bull's eye or central piece of an annular lens.

The various sizes of catadioptric lights were next given in detail; and it was stated that, in order to produce a distinction between different lights, some were fixed and others revolving, while there were many combinations of the two classes. Again, there were modifications to render fixed lights intermittent, and colours had also been employed, to both fixed and revolving lights.

In reference to the method of mounting the lenses and prisms, it was remarked that sea-lights, on account of their size and weight, were on account of their size and origin, necessarily divided into several portions. The section of the apparatus, consisting of lower prisms, lenses, and upper prisms, gave a prisms, lenses, and upper prisms, gave a convenient division into three tiers, each of which was subdivided into panels of a convenient size. In a first order fixed light, the circumference was divided into eight panels of 45deg. each, which were made of gun-metal racks, or side pieces, formed to receive the lenses or prisms, these side pieces being connected together by gun-metal segments of rings at the top and bottom. The author then proceeded to describe minutely (1) one segment of a first order light, in which all the joints of the panels were vertically over each other; 2) an arrangement with inclined lens-panels, the upper prism panels being so placed that their joints did not come vertically over those of the lower prism panels; (3) a first order apparatus where the upper and lower prisms were fixed; (4) an eight-sided revolving light, collecting the whole light into eight beams of parallel rays : and (5) a first order apparatus, commonly called a "fixed light varied by short eclipses," a title which

an eclipse, the same phases being continually repeated.

repeated.

The construction of the panels was referred to in detail; and it was observed that, when the fitting was finished, the panels were taken to the erecting shed, where they were erected on their pedestals, or on, what was more convenient, a revolving table, specially constructed so that each panel, or part of a panel, could be brought in succession opposite the erecting post. The prisms were passed into their places, one end covering plate of the panel to be set being removed, and wooden wedges were used to support the glass and enable it to be accurately adjusted in its position by means of internal observation, as explained by Mr. Chance in his paper. When the prisms were adjusted, plaster of Paris was applied at all the corners, to retain the prisms in their correct position, and, when fairly set, the wedges were removed and the remaining spaces filled in with best red lead putty.

The arrangement of panels generally adopted was that of placing one panel over the other, so that the joints should be vertically over each other. It had in its favour simplicity, a minimum loss of light, a minimum cost, and strong, convenientshaped panels. These advantages had been considered of such importance, that in France this method was still adhered to, and all the lanterns were constructed with vertical standards placed in front of the obscuration caused by the sides of the panels. This plan, however, rendered as many points, on rather small arcs, on the sea as there were standards in the lantern, to be illuminated with a considerably weaker light. late Mr. Alan Stevenson was the first to introduce inclined lens-panels, with a view to equalize the distribution of light on the sea, but he was no doubt well aware that the total loss of life would be increased. Inclined standards had been adopted in several instances, but without any alteration in the optical apparatus. The horizontal divergence, resulting from the size of the burner in a particular case alluded to, might be taken at 6deg., and the standard was inclined over an angle of 7 deg. in plan, so that when an observer was placed in front of the standard, it nearly stopped off the light from him throughout its entire height, commencing on one edge of the flame and finishing on the other, thus obstructing much light which had successfully passed through the apparatus. The lantern of Mr. Jas. N. Douglass, M. Inst. C.E., the engineer to the Trinity House, was designed to render impossible a correspondence, or optical coincidence. between the framing of the apparatus and that of the lantern. In the author's opinion, this lantern was expensive, from the amount of workmanship of a costly class, and from the glass cut to waste.

An arrangement had been designed by the author with a view to obviate the objections to previous methods. The first consideration was the optical apparatus, and it was apparent that a minimum amount of light was stopped by vertical panels, and that it was possible to divide the pre-vious large obscurations into a greater number of smaller ones, thus equalizing the light without increasing the total obscuration. By excentering, or placing the various tiers of panels so that their joints did not come vertically over each other, each previous obscuration was divided into three. The amount of excentering necessary depended upon the size of the flame, so as to enable one obscuration to be completely passed before entering upon another. In a first order, for example, the panels were 45deg. each; and, as there was modiate rack in the prison panels, there was a space of  $22\frac{1}{2}$  deg. between each obscuration. Each large obscuration could be divided into three small ones, which, if placed at intervals of 74deg., would never allow more than one obscuration to be visible The next consideration was the lantern, at a time. which, when arranged with excentered panels, was rendered less rigid, owing to its weight not being transmitted continuously downwards, as was the case with vertical continuous standards. This want of rigidity would be objectionable in a light illuminating the whole horizon, but in those illuminating from 180deg, to 270deg. (which were by far the most common), the dark are could be filled in with solid iron plates, by which any amount of rigidity could be obtained. By the substitution of triangular frames in the central tier, it was still possible to retain the upper and lower panels excentered, and to render the framing perfectly rigid; in fact, more so than with the vertical continuous bars of the old lanterns.

in fixed light varied by short eclipses, "a title which did not convey the actual effect, as the fixed light first order lantern with inclined standards, (2) of was followed by an eclipse, then a flash, and next the lantern to which the French engineers adhered

<sup>\*</sup> Institution of Civil Engineers.

for all apparatus burning oil, and (3) of the lantern arranged by the author to ensure the most uniform distribution of light.

The three principal varieties of lamps in use for sea lights were the mechanical, the high reservoir, and the pressure. The mechanical were the most general, being used in Scotland, France, and many foreign countries. The oil was forced over the burner by pumps, which were worked by clockwork placed underneath and driven by a weight. One of the best high reservoir lamps was that designed by Captain Nisbet, of the Trinity House, and which had been applied to several English lighthouses. Lamps of this class were not, how-ever, applicable to revolving lights, or those illuminating all the horizon, on account of the obstruc-tion of light that would be caused by the reservoir. The pressure lamp of M. Degrand, of Paris, was next noticed. In it the oil was forced over the burner by means of a weight pressing directly on the surface of the oil. It was found that the large space between the piston and the cylinder in this lamp rendered the leather packing liable to turn over when the oil got heated, and softened the leather; added to this, there was no provision for varying the weights on the piston. To meet these objections, M. Masselin designed a lamp with external weights, which gave excellent results, and had the advantage, not possessed by the high reservoir lamps, of being equally well adapted for fixed and revolving lights, whether the whole horizon was illuminated or not. This lamp was minutely described; and in the next section of the paper an account was given of a first order clockwork, consisting of two trains of wheels, one for driving the apparatus, and the other for driving a flywheel with adjustable vanes for regulating

In conclusion, the means adopted for lighting the entrance to Odessa harbour were described. At the extremity of one breakwater a tower was built, to contain a fourth order optical apparatus fixed for 270deg., with a metallic reflector for the remaining 90deg. At the extremity of the other breakwater a beacon was erected, but it was required that a light should be shown without there being a lamp, or any metallic reflector at that place. Accordingly, a sixth order holophote was placed in the tower, to collect all the light from its lamp into one beam of parallel rays, which was thrown across the entrance to the harbour to illuminate the beacon, producing thus what was called an apparent light. On account of the distance of the beacon from the holophote-300ft.—much light was lost, and the divergence of the beacon was small, but ample for what was required, as it was placed low, and a range of only about one mile was required.

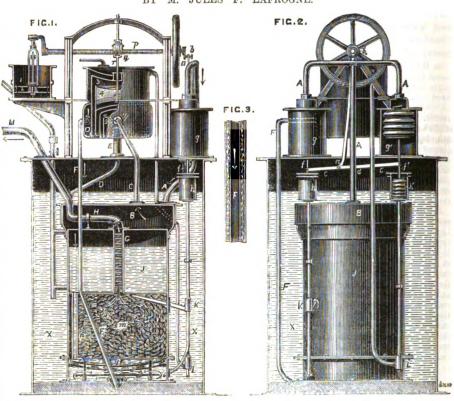
The communication was accompanied by fiftysix diagrams, and by six sheets of carefully executed drawings to a reduced scale.

# MANUFACTURE OF GAS.

N invention, relating to the production of gas for lighting and heating purposes, by the carburation of atmospheric air, has just been patented by M. Jules François Lafrogne, of 23, Boulevard de Strasbourg, Paris. The characteristic features of the invention are the following: -- First the apparatus is combined with a motor, which obtains its power from a portion of the gas produced, and which directly feeds the carburator or hydrocarbon reservoir with the atmospheric air necessary for the generation of the gaseous vapour. Second, the motor allows of establishing a circulation of water in the jacket or casing, around the carburator, for the purpose of absorbing the cold resulting from the evaporation of the essence or hydrocarbon. The cooled water is sent into the motor, in which it is re-heated by serving for the condensation, and it returns into the jacket, restoring the lost heat to the essence, so that the essence being constantly re-heated by the water in proportion as it is cooled, there is no interruption or diminution in the production of the gas. Third, the air is drawn by bellows worked by the motor, heated in an annular space surrounding the motor, and then sent into regulating bellows, in which it accumulates under a nearly constant pressure. Fourth, the air becomes saturated with carburetted vapours in traversing a series of layers of fiannel and wood shavings, or sawdust, which are soaked with the essence by capillary attraction, and which, besides, is always damped therewith by means of a pneumatic injector worked by the motor. The saturated air rises through a series of alternate layers of flannel, wood shavings, and iron filings, filled with sawdust or other substance isolating

# FOR MANUFACTURING APPARATUS GAS.

BY M. JULES F. LAFROGNE.



which deprive it of the excess vapours and nonvolatilized globules; it afterwards issues in a suitable degree of saturation by a pipe, from which it is distributed for consumption.

In our engraving, figs. 1 and 2 are front and side views of the apparatus in sectional elevation. Fig. 3 is a longitudinal section of part of the pipe which conducts the air to the carburator. The motor employed is worked by hot air and cold air, and is composed of a cylinder 1 provided with a piston 2, and of a cold air chamber 3, enclosing a hollow piston or movable pan 4, and surrounded with a piston or movable pan 4, and surrounded with a cold water receiver. The movements of the two pistons 2 and 4 are effected so that when the dilated air has raised the first-named piston 2, the other piston 4 rises suddenly to draw hot air into the cold part of the chamber 3, which aids the descent of the first piston 2. The lower part of the chamber 3 forms a combustion chamber 5 which is provided with a chimney, and which is heated by a burner E supplied by a branch o from the outlet pipe H of the carburator. The piston rod of the motor is connected by a crank to a shaft p, which by a cam q and rod r is worked by the rod of the hollow piston of the chamber 3. The rod which works the hollow piston actuates the bellows, either directly or through a lever or connecting rod.

The motor gives motion to the rod a, by means of the crank b, and the motion of the rod a causes the oscillation of the beam c, upon its centre of suspension d. The oscillating movement of the beam c causes the alternate ascent and descent of the two piston rods f f<sup>1</sup>, and, consequently, the successive compression and dilatation of the four bellows g g <sup>1</sup> and h h <sup>1</sup>. The former of these, g g <sup>1</sup>, cause the continuous aspiration and repulsion of the air within the cylinder; the two latter, h h 1, are for another purpose, which we will presently state. The air repulsed continually through the pipe A flows into the upper partition B of the cylinder, and thus forms a regulating reservoir. From thence the air escapes by the pipe C, and enters the annular space D, which surrounds the hurror E. The air receives an elevation of terms. burner E. The air receives an elevation of tem-perature while within this annular space, which favours its carburation, and its combustion afterwards; then it proceeds in a heated state through the pipe F to the lower partition of the carburator-This pipe F, of which a portion is shown separately in longitudinal section in fig. 3, is double. The interior pipe serves for the circulation of the hot air, while the space left between the two pipes is

This arrangement of the tube F has th heat. effect of preventing the cooling of the air in it passage from the annular reservoir D to the car burator.

On proceeding from the pipe F, the hot air tra-On proceeding from the pipe r, the nor air universes the little wad of flannel i, then circulates between the plates j, k, and l, following the course indicated by the arrows. The combination of these plates, alternately arranged, forces the air to divide itself, while hindering its progress, and to become saturated with the volatile properties to become saturated with the volatile properties of the hydrocarbon, which it thus thoroughly traverses. Above the dust plate l the air completely traverses the body or layers m of wool and wood shavings, impregnated with hydrocarbon or volatile oil. Then, after having undergone the further carburation from the layers of saturated flannel and filings within the pipe G, it escapes in a fit state to be used for lighting purposes, through the tube H, which distributes it as required.

The hydrocarbon is contained by the reservoir J, from which it flows through the tube n, to bathe the plates j, k, l, and the lower part of the body of wool H. This mass, in addition, always receives an injection of the hydrocarbon at its upper part, from the little pump, actuated by the bellows h above referred to. The second bellows, h l, draws cold water from the lower part of the exterior reservoir X, by means of the pump L, to force it to the upper part of the motor, and thus assist the cooling of the latter. A branch pipe o feeds the burner E.

After having filled the reservoir J with the carburating liquid-an essence of schist or petroleum or other hydrocarbon—the apparatus is put in action by the hand, and when in this manner a small quantity of gas is produced, the burner E is lighted. In a few minutes the motor will commence to work, and the apparatus will act of

A Parliamentary return shows that in the year 1868, 6,805,659cwt. of foreign sugar were imported into the United Kingdom, and entered for home consumption here. 2,962,420cwt. are returned as coming from Cuba, the largest importation ever received from that source; 1,210,414cwt. from Brazil; nearly 1,700,600cwt. from the Continent of Europe. The total import of foreign sugar in 1867 was 7,149,940cwt., and of sugar from all quarters entered for consumption here 11,697,328cwt. The total for 1868 is stated at 11,892,832cwt., but this is subject, we believe, to deductions for over entries and exports on drawback. A PARLIAMENTARY return shows that in the year



# TRIAL OF THE "INCONSTANT."

VESTERDAY week the "Inconstant" underwent her first trial of speed at Stokes Bay. This vessel, it will be remembered, is the first of a special class of armed ships, whose object is speed a special class of armed ships, whose object is speed rather than power. She is sister to the "Volage" and the "Active," recently launched from the Thames Iron Works yard. Since she was launched, the "Inconstant," which measures 4,066 tons, has been fitted by Messrs. John Penn and Sons with very fine engines of 1,000 (nominal) horse-power, and he have armed with six 61 to gauge here. and has been armed with six 6½-ton guns on her upper deck, and ten 12-ton guns on her main deck. Half an hour after her start from Spithead upon the present occasion her screw was doing 64 revolutions er minute, and at half-past ten it had reached 70. The first run of the measured mile to the westward was made in 3min. 37sec., which is at the rate of 16-520 knots an hour; the second to the east in 3min. 53sec., or the rate of 15-451 an hour. The mean of the two runs was 16.0205 knots, which is more than a knot in excess of the contract rate. No doubt, however, when the "Inconstant" comes to run her official trial with all her stores on board, this speed will be somewhat reduced, although, on the other hand, it is to be taken into consideration that her engines will be in a better condition than they could possibly be at the builder's trial when 73 was the maximum number of revolutions attained. There are eleven boilers, heated by thirty-two large and six small furnaces, to drive the surface condensing engines, the cylinders of which are 112in. in diameter, and are on Penn's doubletrunk principle. The trunks are 41in. in diameter, and the cylinders have an effective diameter of 1044in. The length of the stroke is 4ft., and the diameter of the axle 191in. The propeller is a "Griffiths," with two blades, set at a mean pitch of 24ft., but capable of variation to 21ft. and 27ft. The water is circulated through the condensers by a pair of centrifugal pumps, which, with their separate engines, are notable as fine specimens of workmanship. In the condensers there are 12,552 metal tubes, a number, we believe, quite unprecemotal tubes, a number, we believe, quite unprecedented. The pressure at full steam was 26, and the vacuum showed  $27\frac{1}{2}$ deg. The horse-power being, as we have said, 1,000 nominal, that indicated should have been, according to the terms of the contract with the engineers, 6,000; but it attained to 6,600, or 10 per cent. more than the amount stipulated for. The lowest temperature in the form state halo was 31deg, and in the form the fore stoke-hole was 81deg., and in the after 90deg.; but in the firing up it rose to 140deg. forward and 148deg. aft. The only fault that could forward and 148deg. aft. The only fault that could be found with the machinery was in the setting of the screw, which had a tendency to go on or go back—at any rate to keep moving— when the engines required it to stop. This is, however, no novelty in new screws, and a very little attention will set it right before the engineers hand over their work to the Admiralty. After a few trials of the screw and the command over the helm, the "Inconstant" was taken into harbour, the whole having proved a most creditable trial.

# A NEW DECORATIVE MATERIAL.

THE slowness of painting operations in buildings. the obstruction caused by workmen, and the disagreeable smell from fresh paint, are great inconveniences inherent to the present mode of painting and decorating. To remedy this, M. Jean painting and decorating. To remedy this, M. Jean Marie Lasché, of No. 23, Boulevard de Strasbourg, Paris, has just patented an invention, the object of which is chiefly to dispense with painting operations in the house or room to be decorated, and to prepare the painting at a factory or shop, so that it can be applied to walls or other surfaces by ordinary hangers or layers, without giving rise to disagreeable smells. The invention consists in producing the painting upon tin foil. M. Lasché takes thin tin foil, which possesses great flexibility, and spreads it upon glass, taking care to damp the glass in order to facilitate the spreading and re-tention of the foil. The foil thus spread consti-tutes a very smooth surface, on which the inventor paints or colours in oil, either plain or ornamental, as on walls or wainscots. It is allowed to dry, and is then varnished. This portable painting, when removed from the glass with its lining of tin, is ready to be applied in a house or otherwise. This new covering or hanging is wound on rollers like paper hangings, but it differs from them, inasmuch as the colouring or painting is on tin and in oil; the back or tin lining constitutes a waterproof surface, and the tin, owing to its great flexibility, can be adapted to the configuration of all mouldings or irregularities. Before applying

the tin hanging or covering, a waterproof mixture is spread on the wall or surface to be decorated, and the hanging is then cut and applied, being made to follow the irregularities of the mouldings and ornaments. This tin covering may also replace gilding, the gold being applied on the tin foil with the ordinary preparation. It is dried and cut, and after having had a waterproof mixture spread on the ornaments or surface to be decorated, the pieces of tin gilding are applied to them. The advantage of this tin gilding over ordinary gilding on metals is that it does not oxidize, while ordi-nary gilding on metals soon becomes spotted or tarnished. This invention thus constitutes, as it wore, a new process of decorative painting, which dispenses with all labour at the place of application, except simple hanging or laying. We have by us some samples of this new material, which are exceedingly appropriate and effective.

### THE BERMUDA FLOATING DOCK.

THOSE of our readers who watched the progress THOSE of our readers who watched the progress of Mr. Campbell's patent floating dry dock, at the works of his firm at Silvertown, will be glad to learn that a memento of this fine structure still remains with us. This consists of a very fine chromolithograph, which has just been published by Mr. John B. Day, of Savoy-street, Strand. The drawing, which is most effective represents the "Warrior" John B. Day, of Savoy-street, Strand. The drawing, which is most effective, represents the "Warrior" docked, without the caissons; the scene is laid at Plymouth, where the original photographs were taken. This dock was designed for docking ships of the "Bellerophon" class when waterlogged beor the Beisrophon class when waterioged between the caissons, and is capable of lifting without the caissons a vessel of 8,700 tons weight, which, with the weight of the dock itself, 8,000 tons, gives a total displacement of 16,700 tons. The length of the dock over all is 381ft., breadth over all 123ft., inside width 83ft., depth 74ft. The dock was launched on September 3 last, and, we understand, is shortly to be forwarded to its destination. Mr. Day's lithograph is an excellent example of the art of chromolithography, and a faithful representation of the dock

### STATISTICS OF BOILER EXPLOSIONS.

IN consequence of the frequency of boiler explo-A consequence of the frequency of botter expined sions in the manufacturing districts of Lancashire and Yorkshire, a meeting of cotton spinners, engineers, and other users of steam power, was held in the Town Hall, Manchester, on January 23, 1855, when an association was formed "For the Prevention" of Steam Boiler Explosions," and a committee of management appointed, of which the late Mr. Henry of steam Boner Expiosions, and a committee of management appointed, of which the late Mr. Henry Houldsworth was president, and Messrs. Ashworth, Bazley, Fairbairn, and Whitworth, vice-presidents. It was not, however, till the latter end of March of the same year, when Mr. R. B. Longridge was appointed Chief Inspector, that the Association commenced operations. On December 31, 1855, the number of members enrolled was 269, with 920 boilers; and, at the close of the year 1859, had increased to 530 firms, with 1,619 boilers. From this date, however, a decrease took place in consequence of the formation of "The Boiler Assurance to the system of periodical inspection as carried out by the original Association,—undertaking to make good any damage that might result from the explosion of a boiler or the collapse of flues. The formation of such a company was first proposed by Mr. sion of a boiler or the collapse of flues. The forma-tion of such a company was first proposed by Mr. Thomas Forsyth, manager at Messrs. Sharp, Stewart, and Co.'s works; and, in the spring of 1858, a provisional committee, consisting of himself and a few of his friends, was formed with this object. Little progress was, however, made, owing to the untimely death of Mr. Forsyth shortly afterwards, by the explosion of a locomotive boiler at the works

of his employers.

Towards the close of the same year, the question of boiler insurance was submitted to the Committee of the Association before-mentioned, but was un-favourably received, the whole of the members prenavourably received, the whole of the members pre-sent being opposed to the principle of insurance. Mr. Longridge, however, took a different view of the suggestion, and believing that a company which undertook the inspection of boilers combined with insurance could not, if well managed, fail to succeed, insurance could not, if well managed, fail to succeed, resigned his appointment with the view of forming such a company. In the spring of 1859, the organization of the Boiler Assurance Company was completed; and, by the end of the year 1860, the Company had received proposals for the insurance of 3,149 boilers, while, at the same date, the number of boilers under the inspection of the original Association had fallen as low as 1,360. It may also be here mentioned that, in the year 1858, an Association for the prevention of steam boiler explosions was

bers becoming connected with the Steam Boiler Assurance Company.

The success of the latter led to the formation of

The success of the latter led to the formation of two similar companies, one of which originated with the principal iron masters of South Staffordshire in 1862, in consequence of a boiler explosion which occurred near Bilston, by which twenty-nine persons lost their lives. The same company has since established a branch in the north of England, principally appropried by the iron masters and coal established a branch in the north of England, principally supported by the iron masters and coal owners of that district. The other company was formed in London in 1864, but subsequently transferred its head-quarters to Manchester. The number of boilers enrolled with the "Association for the Prevention of Boiler Explosions" had, as already stated, fallen from 1,619 in 1859, to 1,360 in 1861, but subsequently increased to 1,455 at the close of 1,861. subsequently increased to 1,415 at the close of 1864, when that Association also adopted the principle of insurance, the advantage of which has since shown insurance, the advantage of which has since shown itself by a considerable accession of members. About the same time (January, 1865), the Boiler Assurance Company was converted into a Limited Liability Company, under the title of "The Boiler Insurance and Steam Power Company, Limited." The following shows approximately the number of boilers under the inspection of each of these Associations on December 31, 1868:—

n December 31, 1808:—	
The Boiler Insurance and Steam Power	
Company, Limited ·	10,900
The Midland Steam Boiler Inspection	
and Assurance Company	2,600
The National Boiler Insurance Com-	,
pany, Limited	2,000
The Association for the Prevention of	
Steam Boiler Explosions	1,900
Total	17,400

Total . . 17,400

In the course of the last ten years there have been in the United Kingdom not less than 495 boiler explosions, by which 786 persons have lost their lives, and a yet greater number have sustained serious injuries. It may therefore be stated in round numbers that 50 explosions, causing 80 deaths, occur annually. During the same period (ten years) 16,411 boilers have been insured, and periodically inspected by the Boiler Insurance and Steam Power Company, of which only 15 have exploded. Of those inspected by the other companies, 11 have exploded, viz.:—

Midland Steam Boiler Ins	spect	ion a	nd	
Insurance Company	٠.			4
National Boiler Insurance	Com	pany		2
Association for the Prevent				
Boiler Explosions .		•	•	5
Total				11

The total number of inspections made by the officers of these companies in 1868 were as follows, viz. :---

Boiler Insurance and Steam Power	
Company	40,952
Midland Steam Boiler Inspection	•
and Insurance Company .	11,900
National Boiler Insurance Company	6,000
Association for the Prevention of	
Steam Boiler Explosions .	6,588
Total	65 440

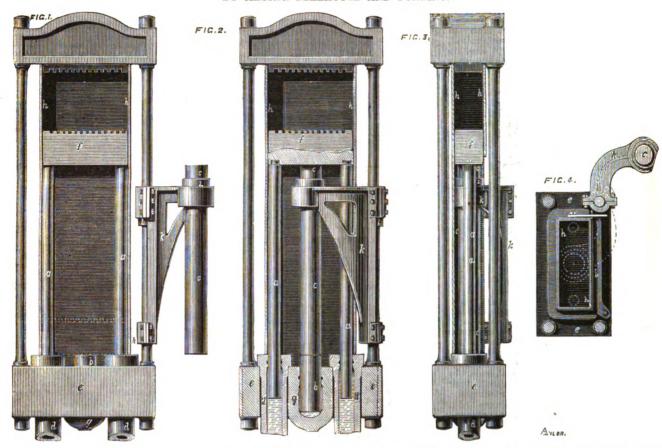
The rates charged by the first-named company, which extends its operations to all parts of the United Kingdom, average 20s. per cent. per annum for insurance, including periodical inspection, and 17s. 6d. per boiler per annum for periodical inspection alone. The rates of the other companies differ but slightly. The expense being so trifling, there is little or no excuse for those whose boilers explode through neglect of inspection; but so long as boiler explosions continue to be regarded as "accidents" for which no one is responsible, many of the users of steam power will rather incur the risk of explosion than pay a fee, however small, for the inspection of their boilers. That such inspection has been of great service in preventing explosions is proved by the detection of the numerous dangerous defects enumerated in the reports published by these companies. The rates charged by the first-named company,

A PITTSBURGH firm have recently made a steel A litter of the man have recently made a steel roller for rolling metals at the Philadelphia mint, which, after a test of several weeks, has been pronounced superior to the Prussian. It is said to have been hardened by a new process, discovered by the manufacturers. Another roller has been ordered of the same firm for the same mint, to be used in selling right. rolling nickel.

On April 23, about 11 a.m., a train on the Long Island (New York) Railroad crossed a broken rail and ran off the track while at high speed, and the last carriage, which contained fifteen passengers, was instantly broken to pieces. Eight of the passengers and a brakesman were killed outright, while the others were scriously injured. Every year a disaster involving loss of life occurs on this railway, and this latest one has created much indignation the officers of the road being agreeing required. the officers of the road being severely censured

# HYDRAULIC PRESS.

BY MESSRS. BELLHOUSE AND DORNING.



# HYDRAULIC PRESSES.

MESSRS. BELLHOUSE and DORNING, of Manchester, engineers, have recently patented some improvements in hydraulic presses. They employ in one arrangement three rams with their respective cylinders, the rams and cylinders being ranged in line with the others, the two outer rams and cylinders being of a length suitable to the entire lift of the press table. The centre cylinder is made suitable for a ram of a greater diameter than the two outer rams, the stroke of the ram being considerably less than that of the outer rams, the central cylinder being cast in one portion with the lower crosspiece of the piece. When the compression of the material is commenced the two outer rams are forced up by the pumps, the central ram remaining stationary, the action of the outer rams continuing until such time as a greater pressure than the outer rams can communicate is required, at which time an intermediate piece is placed between the upper part of the central ram and the lower part of the press table or follower, and the three rams are forced up simultaneously to produce the final compression, the intermediate piece transmitting the thrust of the central ram to the follower. The intermediate piece is of metal, and of a form similar to an ordinary press ram, and is suspended from a crane swivelling around one of the press columns. By the employment of the intermediate piece, the inventors are enabled to use a shorter central eylinder, and pumps of a less capacity than would

otherwise be required.

The press we have illustrated is adapted for the packing of fibrous materials, as, for example, cotton, and is fitted with a box to contain the cotton. The details of construction of the box, as well as portions of the press, are not represented, presenting no features of novelty. Fig. 1 is a front elevation of a hydraulic press constructed in accordance with Messrs. Bellhouse and Dorning's invention; fig. 2 is also a front elevation, partly in section; fig. 3 a side elevation, and fig. 4 a plan. In the figures, a a are two outside rams, b is a central ram, and c is the intermediate piece. The two rams a a work in the cylinders d d, which are fitted into the foundation casting e, the upper ends of the rams being connected with the follower f, and the central ram b works in the short cylinder g, which is cast in one piece with the foundation piece e. The sides of the box in which

the cotton is placed are shown at h h, and the box is fitted with doors which can be opened when the pressing is completed, as is usual; and also with a door, shown at i, in fig. 4, which door can be opened previously to the completion of the pressing, and which, when opened, admits the intermediate piece c to be moved into position under the follower. The intermediate piece is carried by the crank k, which is fitted to swivel around one of the columns of the press, being supported by the collar l formed on the column. The piece c is sustained on the crane by the collar 2, which rests upon the boss formed on the end of the crane, and the piece is free to slide in the boss when a force is applied tending to move it in an upward direction. The proportions of the crane are such as that when the intermediate piece is moved into position under the follower f, as shown by the dotted lines in fig. 4, the longitudinal centre line of the piece will coincide with the centre of the ram.

The action of the press is as follows:—The box having been filled with cotton, it is placed in position in the press and the water pressure is admitted to the two outer rams a, by which means the follower f is forced upwards from the position indicated by the dotted lines in fig. 1 to the position as represented by the full lines, and the cotton contained in the box is thus compressed into a smaller compass, the force required to effect the compression being as great as can be conveniently applied to or transmitted by the rams a. The door i is now opened, giving access to the lower portion of the box, only without interfering with the enclosure of the cotton, that is, the door extends in an upward direction to the under side of the follower f, or a little over. The crank k is now swivelled into the position as represented in fig. 2 and by the dotted lines in fig. 4, and the intermediate piece c is thus brought directly over the ram b, the upper end of the piece being in contact, or nearly so, with the under side of the follower. The water pressure is now admitted to all the three rams simultaneously, and the follower is forced upwards with the increased pressure due to the action of the ram b for the remainder of the usual lift of the follower or until the cotton is compressed to the required extent, the intermediate piece acting for the time being as a continuation of the ram. The compressed cotton is now formed into a bale in the usual manner, and the piece c is swivelled or moved outwards in order to admit of

the follower being "run down," the succeeding operations being substantially as already described by us.

Although cotton only has been mentioned when

describing the action of this press, it may be employed in the packing of other materials or substances. A short cylinder similar to that marked b in the engravings, acting in conjunction with a movable intermediate piece, may be employed in presses having more than two cylinders and rams of the ordinary construction and proportions, or similar to the rams a a and the cylinders d d, as may be found convenient.

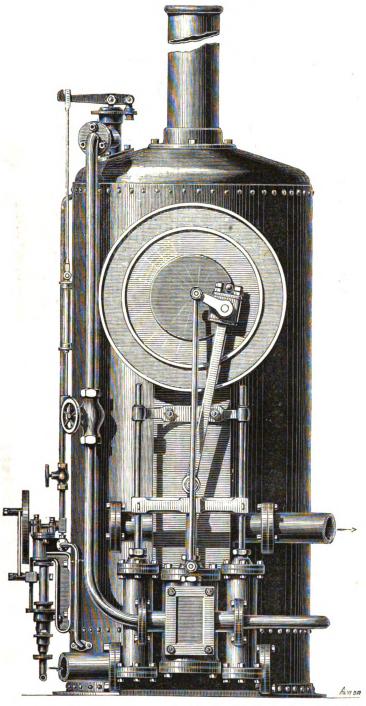
# CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

A T the ordinary meeting of this society, held at their rooms, Whittington Club, on Wednesday week, the president, Mr. B. Haughton, in the chair, a paper, upon "Water Supply to Towns and Villages," by Mr. George W. Usill, was read. The author, after tracing the history of water supply throughout all ages, and describing the great works of the ancients, proceeded to investigate the phenomenon of rainfall, and its effect upon the British Isles. By a very lengthy resume of the experiments which have been made during the past two centuries by the most eminent scientific men of the period, the author treated the questions of evaporation and absorption—the chief agents at work to diminish the available supply from the rainfall. He then considered the various methods of obtaining a supply of water from drainage or collecting areas, from rivers and streams, from springs and from wells, and the principles involved in works from the two first sources, leaving the other questions to follow with the second part of the paper. At the termination of the paper, a vote of thanks was awarded the author, and a very animated and interesting discussion then commenced, in which Messrs. Haughton, Pain, Sefi, Meakin, Roberts, G. J. C. C. Godsman, F.R.A.S., and others, took part. Before adjourning the meeting, the president gave notice that at the next meeting of the Society, June 2, a paper, upon "The Building Stone Used in the Metropolis," would be read by Mr. A. F. Pain; to be followed, June 9, by a paper, on "Steam and other Power Hammers," by Mr. F. H. Roberts, honorary secretary. The meeting was then adjourned.



#### IMPROVED DONKEY ENGINE.

BY MESSRS. A. WILSON AND CO.



# WILSON AND CO'S DONKEY ENGINE.

T is now some ten years since Giffard's injector called the attention of engineers to the advan-tages of a boiler feeder which should dispense with the feed pumps of the engine. Its beautiful sim-plicity at first sight would have led a casual ob-server to say that the days of pumps of every description were numbered, but the result in pracdescription were numbered, but the result in practice has been to stimulate the manufacture of pumps of every form, principle, and design, thus making good the old saying that competition is the soul of trade. Although donkey pumps had been used to some extent for a great many years prior to Giffard's invention, it is only since its introduction that the manufacture of this class of pump has obtained prominence as a specialty and as our has obtained prominence as a specialty, and, as our readers are no doubt aware, they are now about as plentiful and cheap as the well-known "forty shilling watch." They may be divided into two great classes of flywheels and non-flywheels. Of the respective merits of these two classes we do not now intend to speak, but we have no doubt that each has its votaries, and that the flywheel, with its tangible and convenient mechanism, will not be soon superseded by hidden and mysterious tappet notions. We recently met with some good examples

of the flywheel class at the works of Messrs. Alexander Wilson and Co., of the Vauxhall Iron Works, Wandsworth-road, their recent productions possessing points well worthy of notice. An inspection of Messrs. Wilson's works showed us that these manufacturers have now reduced the production of steam pumps to such a speciality that they are turning them out at the rate of ten to twelve per week. This has enabled them to adopt the system of having special tools for executing particular work, and having machines and workmen set apart for the manufacture of particular details. For instance, one lathe is continually boring cylinders, one turning wheels, another finishing connecting rod ends, and so on, through all the various details till they are ready for the fitter to put together. The result of this system is that they are enabled the result of this system is that they are enabled to attain great excellence of workmanship, and yet sell a pump at a price which must astonish some engineers. They successfully solve the problem of how England may yet be able to compete with the cheaper labour of the Continent, for we may mention that Messrs. Wilson send considerable numbers to continental countries, where, in addition to the cost of carriage, they have to compete with Giffard's injector, sold at a price about 30 per cent. less than in England, in con

sequence of its not being patented in some of these

countries.

We have selected for illustration a steam pump of large size attached to a boiler manufactured by Messrs. Wilson, which, while differing considerably from their well-known pattern, contains several points of novelty, and for a flywheel pump gets the machinery into the smallest possible compass without any overcrowding or complication. This pump was started during our visit to the Vauxhall Works, and we were much pleased with its working. A prominent feature is the education working. A prominent feature is the adaptation of the framework to form a capacious air vessel, while the steam cylinder is placed between two pump barrels, which, however, work into the same suction and delivery valves, each set of which are conveniently accessible by means of doors on either side of the pump. The prolongation of the pump rods form very efficient guides to the steam piston rod, all three being made of Bessemer steel. At first sight, objection might be taken to the close proximity of the water barrels having a tendency to cool the steam cylinder, but in practice it is found that when the engine has been running for half an hour without pumping any water, the temperature of the barrels does not sensibly increase. Suction and delivery pipe connection is arranged on each side of the pump, so that the pipes may be taken to the right or left of the pump, according to its position, the other being closed with a blank flange. On board ship, it is, however, often convenient to here one writer to the bilar and convenient to have one suction to the bilge and another to the sea, and one delivery to the boiler, while the other can be used for washing decks, &c. Our illustration shows the boiler supplied &c. Our illustration shows the boiler supplied with a No. 4 pump, attached conveniently to its side, but the large pump can be arranged to supply its own boiler, which is, however, not so convenient as shown in our illustration. It forms an admirable pump for railway stations and in large mills, where repairs have to be done at night and during holidays. The flywheel of the pump is available for driving both lathes and drilling machines. Messrs. Wilson and Co. have just supplied one mounted on wheels for a sugar estate in the West Indies; in fact, it is from the drawings of that Indies; in fact, it is from the drawings of that engine that our engraving was prepared.

# ON INDIAN FIBRES.

BY MR. LEONARD WRAY.

THE subject this evening is that of Indian fibres, a subject which has been frequently brought before this Society,\* and especially by those able and scientific men, the late Dr. Royle and Dr. Forbes Watson, to the latter of whom we are all greatly indebted for the exhaustive manner in which he has treated the subject. I propose to occupy your time but very briefly, as I well know the valuable nature of the discussion which will the valuable nature of the discussion which will follow the opening of this most interesting subject

We cannot avoid dividing our subject into the three great branches which it naturally assumes, viz.:—First, those fine silken fibres so valuable for manufacturing into textile fabrics; second, for manufacturing into textile fabrics; second, those suitable for cordage, &c.; and, third, those adapted only to paper making. And I need not tell you that, to do anything like justice to them, would fill a good-sized pamphlet appropriated to each. Flax and hemp are so largely grown in Europe that we may well leave them out of the question for the present; and I think the same may be said of jute, and others of the same class. The fibre which is now creating a great stir amongst our manufacturers is the "Rheea," so commonly although erroneously called China grass. commonly although erroneously called China grass, as we obtain our supplies almost wholly from China. It is there named "Tchu-mā," and is named in botany Urtica nivea, being of the nettle family. In Assam, a cultivated and a wild variety family. In Assam, a cultivated and a wild variety is found; and in the Malayan peninsula, Penang and Singapore, another variety grows wild, the fibre of which is unusually strong. This has a Malay name, "Rāmee," and is in botany known as the Urtica tenacissima. The partly prepared fibre of the rheea, such as this, is now worth in the market £70 per ton, whilst the beautiful silken fibre, fully prepared, is worth 2s. 4d. per pound, as the fabrics made from it are of so strong and so lustrous a character as to be in universal and so lustrous a character as to be in universal demand. Pity, indeed, is it that this splendid fibre can be obtained only in such small quantities. No other supplies can be looked for, except from China, nor can we expect much from that country either. Its growth and preparation have been tried by most intelligent Englishmen in India, but

' Society of Arts.



they found, first, that the separation of the fibre from the plants was a most difficult and laborious operation; and, second, that the yield per acreper annum was exceedingly small. Indeed, it is said by a gentleman now present to yield only lewt to light of fibre to the acre—a fact which forbids any European from entertaining hope of cultivating it at a profit, which is much to be regretted.

The authors I have alluded to made particular mention of the following plants as yielding fine, silken, and yet strong fibres, viz., the Pederia fœtida, the Jettee, the Moorva, and the pine-apple, each of which they fully describe; and no doubt almost all of them are known to many now present. I quite believe that they each and all of them hold out the promise of amply remunerating any European who will attempt, in a judicious manner, to utilize the beautiful fibres they contain. The Pederia feetida certainly has the most silky and lustrous fibre any one can desire, and its being only in lengths from joint to joint seems the sole objection to it. Still, these joints are often 12in.

apart, whilst the finest Sea Island cotton is not
more than 1in. to 1½in. in staple. Attention
ought, therefore, to be directed to this lustrous
fibre-yielding plant. The Jettee, again, is jointed,
but the joints are sometimes 2it. apart, and the fibre proportionably long. It is a most excellent The pinefibre, and will be sure to make its way. apple, with its beautiful fibre, exists in thousands of acres in the Straits of Malacca, and may be had at Singapore in any quantity for the trouble of gathering, yet no one seems to regard it. This indifference to so tempting an opportunity is really most astonishing, but I imagine it cannot leave the control of the cont last much longer.

Now, the plant which I desire most especially to draw your attention to, is that from which the surpassingly beautiful Manilla handkerchiefs are made. Who has not seen or heard of the long celebrated "Pigna" cloth, which can only be purchased at extreme fancy prices? This magnificent chased at extreme fancy prices? This magnificent production is made from the fibre of Mindanao (Bromelia), in fact, the Bromelia penguin, a kind of wild pine-apple, which is exceedingly abundant in both cast and west. The late Mr. Temple, formerly Chief Justice of British Honduras, some years ago, exhibited a quantity of the fibro to this Society, and he called it "silk grass;" and some present may remember how long, how strong, and how silken it was. We may search the world through, and not find another plant capable of yielding us so rich, so abundant a supply of a fibre, which in quality cannot be excelled. That is a plant which we may look to, to provide us with a very large amount of the very best quality of fibre. I believe this plant has hardly been spoken of; I doubt whether it has been named. It is more easily obtained, and the yield of fibre is very large because each leaf is a mass of fibre, mixed with vegetable matter, which is easily expressed in the green state. Dr. Forbes Watson told me that he looked upon the rheea as the fibre of the future; but if it be true that it only yields lewt. of fibre per acre, you will, I am sure, agree with me in thinking that it cannot be the fibre of the future, unless it can be grown cheaper and in greater quantity than we yet know of. But the fibre to which I allude can be grown exceedingly cheap, and the manufacture involves no difficulty. not know the exact mode by which Mr. Rutledge separated the fibre, but I believe it was on the principle of the thrashing machine, the plant being passed at a slow rate along a platform having a yielding surface, through rollers and beaters; and, when this was done with the plant in a green state, it came out at the other end of the machine very good fibre, which was improved by repeating the operation. A stream of water is used to wash the pulp away as it was expressed from the fibre. These are the principal textile fibres to which I have to draw your attention.

I come now to cordage fibres, and that is so vast a subject, that I feel I ought scarcely to introduce it on this occasion; but the point to which I will call your attention, lastly, is that of fibres adapted to paper making. With respect to paper making, we can be satisfied with a very different character of material altogether, and almost anything of a fibrous nature would answer the purpose. I suppose almost all the plants of England have been tried, and some of the patents are very laughable. I have seen specifications of patents containing columns of names of almost every plant in England. Amongst others, there is the nettle; but with reference to Indian productions, there are plants which yield valuable productions, besides fibre. But there is one plant I was particu-

larly struck with: that is the common canna, one of which often grows as high as 14ft. The whole stalk and leaf are one mass of fibre, so much so that, on cutting down one of these plants in my conservatory, I found the leaves were full of beautiful fibre. The root furnishes that description of arrowroot which is called "Tous les Mois," and is described by chemists as the most nutritious of all the starches—more nutritious than the best arrowroot that comes into the market. That is the first product of the plant; the second product is the fibre resulting from the roots; and the third, the fibre from the stalks and leaves of the plant itself. If we get a double product from such a plant as this, that is getting really a great advantage, and at a cheap rate; and the cheaper you get fibrous matter to make your pulp, the better it will be for all parties.

It may be interesting to you to know in what form this fibre for paper making can be best sent to this country. It is said we cannot have paper mills in India, because, as we see them in England it costs a great deal of money to build and furnish the machinery. We must take into consideration the different kinds of paper made. If we go in only for that kind of paper which newspapers are printed on, that is a simple thing. I saw that kind of paper made twenty-five years ago, in the mills of Mr. Marshman, the proprietor of the "Friend of India," and I was struck with the simplicity of the thing. In the factory, which was a very plain building, a number of women and children were seated, with blocks of wood before them, cutting up old gunny bags to pieces, and those were washed and made into pulp. The pulp was passed between cylinders heated by steam, and the paper was made from it. The paper is worth from 3d. to 4d. per lb., and is well adapted for newspapers. Only consider the quantity of paper that we send to India! Why should they not that we send to India! Why should they not make their own paper? I recollect on one occasion, Dr. Riddell exhibited in this room some fibre from the ochre plant, which he called a paper making plant. That plant is fibrous from one end making plant. That plant is fibrous from one end of it to the other; and Dr. Riddell showed me some paper which was made from it by the simelest process possible—merely pounding it in a spooden mortar, and turning out the paper at once. When we know this, we may well ask, Why not make paper in India? I have here a specimen of a pulp made of Esparto grass, and converted into pulp in Spain. It is worth £20 per ton in the market. That is the form in which I should recommend those who would not make paper in India to send it here. If it is made in larger slabs India to send it here. than this it is difficult to dry. If theroughly dried it will keep for a thousand years uninjured, but, if not quite dry, it is liable to change colour, as this has done; but in this condition little more requires to be done with it to make it into paper.

# ON THE OCCULTATOR.\* By Professor Lewis R. Gibbes.

IN the years 1848—1854, I was much engaged in observing occultations of fixed stars by the moon, and as a means of obtaining the approximate times of disappearance and reappearance with less labour than by calculation, I devised and constructed, in 1849 or 1850, an instrument for that purpose, to which I gave no special name. This instrument is still in my possession, but not in use, as certain parts, presently to be mentioned, have deteriorated with the lapse of time.

The Rev. Thomas Hill, of Cambridge, Mass., has published in the November number of this Journal, a description and figure of an instrument for the same purpose, invented by him in 1842, and called by him the occultator. As the two instruments have the same end in view, there is a general agreement in plan, but the details differ. Mine is founded on the well known method of orthographic projection usually adopted in projecting eclipses and occultations, and I have published no description of it, nor do I propose doing so at the present time; but I wish to mention now, the devises I adopted to overcome certain difficulties which present themselves in both instruments, and the following explanations will be sufficiently intelligible, without a figure, to those familiar with the subject.

Mr. Hill finds the desired projection, on the plane of the instrument, of any point above that plane, as the extremity of a steel rod, by means of a silk thread stretched on a brass bow, set on a triangular base, and made normal to the chart or plane of the instrument, by screws in the base. I

"American Journal of Science and Arts."

effect the same end very simply and readily by the following expedient, based on the optical principle that an incident ray and the corresponding reflected one coincide when they are normal to the reflecting surface. A bit of a good glass mirror with parallel surfaces, and a few inches square, having two lines traced on it with a writing diamond perpendicular to each other is placed on the plane of projection, and moved under the given point, representing the place of observation, until by the eye placed above that point and close to it its image is seen to coincide with the intersection of the lines on the glass. Evidently, this intersection is then the projection required on the plane of the mirror, and the corresponding point on the plane of the instrument is easily determined, if desired, by the use of the intersecting lines as lines of reference. In my instrument there is no necessity for determining this point on the plane of the instrument, as the time of disappearance is found by moving the point representing the place of observation, and the disc representing the moon, to successive corresponding positions belonging to successive minutes of time, until the image of the point is occulted by the disc; the time of reapearance is determined in like manner. Instead of the pointed extremity of the rod, may be used a minute perforation in a thin sheet of metal or of pasteboard, through which may be viewed its image in the mirrors. If instead of either of these, were used a polished bead of glass or metal, smaller than the pupil of the eye, the light reflected from it would be seen in the mirror as a star-like point, which by the principles of the projection employed representatives of the star to be octhe culted, and by the interposition of the disc representing the moon, would actually disappear, and again reappear, as in an occultation. The use of the minute perforation gives the best results, as the eye cannot then fail to be in the proper position above the point indicating the place of observa-

I use the same method for adjusting in position a plane which in my instrument represents the plane of the parallel of latitude of the place of observation; this revolves about an axis, to which ought to be parallel the plane of the instrument or the chart, and this parallelism I test by finding, by reflection, the projections of a certain point in three or more widely distant inclined positions of the plane; these projections ought to lie in a right line. This plane ought also to form with the plane of the instrument, or plane of projection, an angle equal to the complement of the declination of the star, and any line in it, perpendicular to the axis of rotation, being taken as radius, will have its projection equal to the sine of the declination. Having a scale of equal parts, for sines, drawn on the plane of the instrument, corresponding to a certain line in the movable plan as radius. I take from a table of natural sines the proper length for the given declination, and placing the intersection of the cross lines on the mirror, to coincide with the proper point in the scale for sines, I rotate the plane about its axis, until the image of the extremity of the radius adopted coincides with the centre of the cross; the plane will then have the proper angle, without requiring an arc divided into degrees and parts, as in Mr. Hill's instrument

Mr. Hill mentions several methods of adjusting the varying relation between the moon's hourly motion and semi-diameter, and decides finally upon a fixed permanent scale, in inches and parts, for hourly motion, and calculates the corresponding values of semi-diameter and parallax, in order to avoid the labour of dividing in every case the moon's hourly motion along its path into minutes of time. I adopt a permanent scale of 10in. for the earth's radius (which fixes moon's semi-diameter also) compute the value on this scale for the hourly motion of moon in her orbit, from the horizontal parallax and hourly motions in R. A. and Dec., for each occultation, and adjust the instrument this varying quantity, by using a scale of equal parts for minutes of time, laid down on an extensible sheet. This sheet is of caoutchouc, and the scale is made variable by extending the sheet, until sixty minutes or one hour on the scale corresponds in length with the computed value of the hourly motion of the moon. Two such scales might be used if the uniformity of the rate of extension of the sheet could not be trusted through. out the required extent of the variation of hourly motion in different parts of the orbit. These scales, made of the vulcanized caoutchous obtainable at the date of the construction of the instrument, have now lost their elasticity and must be re placed before I can again use the instrument.

These expedients are simple, and I make them



known, as the adoption of one or both may add to the efficiency of Mr. Hill's instrument, or similar instruments. I am not aware that any one had proposed them at the time I applied them to my instrument. I have heard that Mr. Adie, of Edinburgh, has proposed something similar to the last to thermometer scales, I believe, but I do not know the date of his proposal, nor whether it has been adopted in the scales of any instruments.

# FLOWER SHOW AT THE CRYSTAL PALACE.

AST Saturday was a grand day at the Crystal

Palace, the occasion being the great Spring Flower Show of the season, which certainly formed a magnificent floral display. The flowers were arranged in double banks along the whole length of the nave, and were sheltered by a new awning which transmitted the sunshine through it in a soft yellow light. The show was divided into twenty-six classes, which were excellently represented. There were also three special prizes given for bouquets, and a large number of competitors, both English and a large number of competitors, both English and foreign, amateurs and professionals, entered into the contest. The result was a collection of beautifully-arranged groups of choice flowers. The show of pelargoniums was splenkid, the foliage and branches of the examples being totally hidden by the blossoms. The stove and greenhouse plants formed the staple of the show, and included some hundreds of the finest specimens. The grounds round Rockhills were thrown open to visitors, and were thronged during great part of the afternoon, every one going to see the great wistaria which covers the front of the villa. This wistaria, which is probably the finest tree of its kind in England, is now in full bloom, and is covered with thousands is now in full bloom, and is covered with thousands of blossoms, from 10in. to 12in. long. The company was one of the most numerous we remember to have seen upon these occasions.

During the afternoon, experiments were being carried out in the tropical department by Mr. J. carried out in the tropical department by Mr. J. Jeffreys, the inventor of a method of preserving meat by the cold process. Mr. Jeffreys proposes to accomplish this by packing the joints in hermetically-sealed boxes, and then freezing the meat contained therein by means of passing them through a "freezing trunk machine," where they will be exposed to a chilling current of from 15deg. to 30deg. Fahr., by means of an ether engine, and then immediately shipped on board a vessel fitted with a special receptacle excluding all outer atmospheric influences, and also subjected during the whole voyage to chilling currents of 10deg., also kept up by a small ether engine. The results of Saturday's experiments were indicative of success, although the lecture room and the ship at sea on a long voyage present very opposite conditions in many respects. However, a committee has been appointed to investigate the whole matter, and to report the result to the food committee of the Society of Arts.

## DYNAMITE.

DYNAMITE.

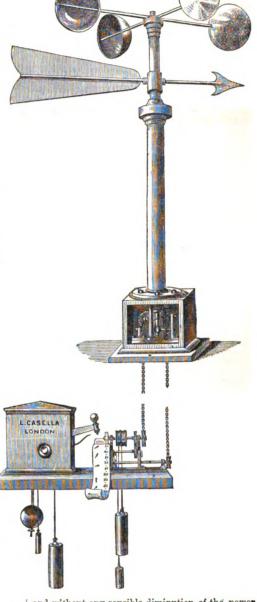
THE following letter upon dynamite as an explosive power, from Mr. W. Hosken, of the Sulphur Mines, Norrtelje, Sweden, dated the 1st instant, appears in the "Mining Journal":—We have been using dynamite here since its introduction by Mr. Nobel. It is well adapted for porous or loose ground, as all miners are well aware how often the charge is lost in cavities or cracks in the ground. Certainly dynamite is a great improvement on powder for that class of ground. In one part of our mines here the lode is occasionally composed of small rounded pieces of rich sulphur, not unlike nuts or marbles, and often there is mixed with the ore, clay, and other decomposed rock, and powder is almost useless in such ground. We use dynamite with considerable advantage, also, in the same ground when it is wet. Looking at the cost of dynamite (2s. per lb.) I do not think it can be generally used in levels or confined places. Our miners here use it with advantage when an opportunity offers in the levels and sinkings. In lime and stone quarries, or large deposits of magnetic iron ore, such as are found in this country, I consider it cheaper than powder. Although not so dangerous as nitroglycerine, it requires careful handling, and a hole or charge that has missed fire should in no case be bored out again.

In consequence of the retirement of Mr. Reverdy Johnson from the United States legation, and his impending return to America, the chair at the forthcoming annual dinner of the Newspaper Press Fund will be filled by the Right Hon. Lord Houghton, president of the Fund. The dinner is appointed to take place at Willis's Rooms on Saturday, June 5.

# EMBOSSING SELF-RECORDING ANEMOMETER.

BY MR. CASELLA.

THIS instrument has been designed for registering the velocity and direction of the wind and the time of its various changes-The general principle of the apparatus is that of Dr. Robinson, of Armagh, in which four hemispherical cups revolve with the pressure of the wind, and give action to most of the other parts. The registering parts of the instrument, however, as well as the vane, are entirely new, and the result of the joint efforts of Mr. Casella, of Hatton-garden, and of Mr. Beckley, the engineer of the Kew Observatory. The force-and-die principle of embossing is the means of registration herein adopted. The paper employed is a narrow strip, wrapped round a small roller, from which it is drawn, and embossed on one edge by the action of the rollers, as shown in the engraving. The rollers are divided to represent miles; they are figured at every ten, and one revolution shows the wind to have travelled fifty miles. The clock raises the small hammer, which falls once in every hour, impressing the other edge of the paper with a small arrow, whose movements are identical with the larger one at the top, and thus shows the exact direction of the wind at the time, as well as its rate of speed during each preceding hour. The paper is of sufficient length to last from four to six weeks without being changed, and the clock may be wound up daily or weekly, as may be desired. The projection below the vane contains metal balls, which firmly support the top, and aid in giving freedom of action. The square box is of cast iron, and contains the stronger portion of the wheelwork; it has holes on the flange for screws or nails, by which means it is easily fixed to the roof of a house, or to a pole placed in a garden, or field, or by the seaside. The chains act on improved rollers, over which they cannot pass without turning them, and are brought into connection with the clockwork and registering parts, placed in a room or box for protection, at any vertical distance from the base, say, from 3ft. to 25ft. In size, the height of the upper part is 39in. from the base of the box, the diameter over the cups is 24in., and its strength and general construction such as to bear the vicissitudes of the severest storm. Where frequent absence is requisite, or in places of difficult access, the little attention required in using this instrument can hardly be overestimated. The action of each one is tested and guaranteed to give the same comparative rate of speed as that of the standard anemometers in use at public observatories.—"Horological Journal." The paper employed is a narrow strip, wrapped round a small roller, from which it



CONTROLLING THE ARMATURES OF ELECTRO-MAGNETIC INDUCTION MACHINES

BY MR. HENRY WILDE.

THIS was a paper on a Property of the Electric Current to Control and Render Synchronous the Rotations of the Armatures of a Number of Electro-magnetic Induction Machines, read before the Manchester Literary and Philosophical Society.

The discovery of the property which the author describes arose out of the efforts which have been made, during the last two years, to reduce the internal heat generated in large electromagnetic machines by the rapid magnetization and demagnetization of the armatures. By constructing the machines of smaller dimensions, this heating was considerably diminished; but an inconvenient residuum of heat still remained when the machines were worked continuously for a long time, such as to render it desirable to adopt some means for abstracting the heat more rapidly.

By means of a current of water, circulating in the hollow brass segments which form part of the magnet-cylinder, Mr. Chas. E. Ryder, the skilful manager at the works of Messrs. Elkington and Co. has happily succeeded in so far reducing this heating as to permit of the machines being worked, for days and nights together, without intermission,

and without any sensible diminution of the power of the current.

The author has already shown, elsewhere, that the current from a small magneto-electric or electro-magnetic machine is sufficient to exite the electro-magnet of a very large machine: and it has been further found, by Mr. G. C. Lowe, that the current from one small machine is sufficient to exite, simultaneously, the electro-magnets of several small machines. In a number of  $3\frac{1}{6}$ -inch machines which have been constructed, under the author's direction, for Messrs. Elkington and Co., for the electro-deposition of copper on a large scale, the currents from two 3½-inch electro-mag-netic machines are made to excite the electro-magnets of twenty similar-sized machines to a degree sufficient to bring out the maximum dynamic effect of each machine.

The electro-magnets of the two 31 inch exciting machines are charged by the current from a small machines are charged by the current from a small magneto-electric machine; but the author has found that nearly as good a result may be obtained from the twenty machines, by dispensing with the small magneto electric machine, and employing the residual magnetism of the two 3½-inch exciting machines, in a manner similar to that described almost simultaneously by Mr. Farmer, Messrs. Varley, Mr. Siemens, and Sir Charles Wheatstone. Wheatstone.

While the subdivision of the materials of one large machine into a number of small ones was attended by several important advantages, yet it

was found necessary to adopt some means to secure the synchronous rotation of the armatures, when the combined direct current from several machines was required.

As the high speed at which the armatures we driven precluded the employment of toothed gearing, the only method which seemed at all feasible for producing the requisite synchronism was to place several machines in a straight line, and connect them together by means of a clutch fixed on the end of each armature spindle. It was while experimenting with a pair of machines so geared together that the author first observed the phenomenon which forms the subject of his

The armatures of these machines were 4in. in diameter, and each of them was coiled with a copper wire conductor, 280ft. long and in in diameter. The currents were taken from the armatures by means of copper brushes rubbing against metal rings connected respectively with the ends of the armature coils, and were therefore in alternate directions for producing the electric light.

The clutch by which the armstures were connected consisted of two iron discs, about 4in. in diameter, having in the face of one, two iron pins which could be guided into two corresponding holes in the face of the other. These discs could be engaged, or disengaged, either when the The relative machines were at rest or in motion. positions of the pins and holes in the discs were such that the armatures might be engaged in reversed positions of half a revolution, when required.

Each of the machines, when making about 2,000 revolutions per minute, was, of itself, capable of producing a very efficient electric light; and when the two armatures were clutched together in such a position that the united positive currents from both machines should proceed from one polar terminal, simultaneously with the united negative currents from the other polar terminal, the sum of the currents from the two machines was obtained. On the other hand, when the armatures were clutched together in the reversed position, without any change being made in the armature connections, no current was produced outside the two machines.

These experiments, besides exhibiting the necessity of synchronous rotation, further showed that the armatures must also occupy the same relative position in the magnet cylinders, in order that the combined currents from the two machines might be obtained. It now occurred to the author to see to what extent the want of synchronism in the armatures would affect the magnitude of the current.

The armatures were therefore unclutched, and allowed to revolve independently of each other, in the same manner as when the attempt was made to take the combined direct current from the commutators. After the alternating current had been transmitted through the electric lamp for some time, it was found that there was no perceptible diminution in the amount of light produced from the carbon points, and that the current would melt, very nearly, the same quantity of iron wire as when the armatures were clutched together. On examining into the circumstances attending this unexpected phenomenon, it was first observed that whenever the machines were stopped, the pins and holes in the respective discs were exactly opposite each other; and that, while the armature were revolving, the two discs could at all times be engaged and disengaged with the greatest facility. Moreover, even when the discs were set (before starting the machine) a quarter, or half a revolu-tion, out of the position in which the maximum amount of current was obtained, it was found that after the aimatures had been revolving for a few moments, the discs resumed their normal positions with respect to each other (as indicated by the action of the clutch); thereby exhibiting, not only the synchronous rotation of the armatures, but also, that the machines contained a principle of self-adjustment to the position in which the maximum effect of the combined current was obtained. It was therefore evident that this property of the current, to maintain the synchronism of the armatures, rendered it unnecessary to employ mechanical gearing of any kind for that purpose.

The author then proceeds to enter into a detailed explanation of the causes which produce the synchronism of the armatures, a summary of which is as follows:-When the armatures happen to be in that position during their revolution in which they are producing the maximum and

minimum amount of current respectively (as must often be the case when there is no synchronism), that current which is at the maximum rushes through the coil which is producing the minimum amount of current,—the effect of this passage of the current from one coil to the other being to accelerate or retard the rotation of the armature (according to the direction of the current) until synchronism is established. On the other hand, the absence of synchronism observed when the direct current was taken from the machines, by means of commutators, is caused by the direction of the currents being coincident with that which they would receive by induction from the electromagnets, and, consequently, opposite to that which tends to impart an accelerating or retarding impulse to the armatures.

The synchronous rotation of the armatures hav ing been secured in the case of the combined alternating currents, it yet remained to obtain the combined direct currents from the two machines. A pair of rings and a commutator were therefore fitted upon one of the armature spindles, which was made sufficiently long for the purpose; and metallic connection was established between the rings of each machine and the commutator on the prolongation of the armsture axis. As the commutator necessarily revolved synchronously with the two armstures, it was found that the combined alternating currents were rectified just as if they had proceeded from only one machine; and were, consequently, available for electro-deposition, or for any other purpose for which a direct current might be required.

Although this property of synchronous rotation has, as yet, been observed only in the case of several pairs and a triple combination, of machines, yet the author sees no reason for supposing that it may not be extended to any number of machines that may be conveniently worked together from the same prime mover. It is necessary, however, to observe that, as the controlling power of the current is only calculated such minute deviations to correct from synchronism as it is beyond the power of mechanical skill to prevent, the driving and driven pulleys should be, respectively, as nearly as possible of the same diameters; as the correction of any considerable difference in the number of the revolutions of the armatures, caused by differences in the diameters of the pulleys, must necessarily be attended by a corresponding diminution of the useful effect of the current outside the machines.

The author concludes his communication by directing attention to an important property of the magneto-electric circuit, which renders the commonly accepted theory by which the generation and propagation of the electric influence in voltaic circuits is explained, inapplicable to those circuits which are entirely metallic. Reference to this property is all the more called for at the present time, as the author finds that a want of acquaintance with it has given rise to no small amount of misconception on the part of several eminent mathematicians and electricians, who have examined his experiments on the electric condition of the earth, and the method by which he has thought proper to estimate the magnitude of powerful induction currents.\*

The intensity of a voltaic current, as represented by the mathematical theory of Ohm, is equal to the electro-motive force divided by the internal resistance of the battery; and from this theory it is inferred than an electro-motor, in order to overcome a great external resistance, must itself possess a correspondingly great internal resistance. A further consequence deduced from this theory is, that the maximum useful effect of a given electro-motor is obtained when the external and internal resistances are equal.

Now, this mode of estimating the magnitude of an electric current does not apply to the circuits on the armatures of the machines invented by the author. Take, for example, the results obtained from the quantity armature of a 10-inch machine. author. The dimensions of the coil of this armature may be represented by a bar of pure copper 67ft. long, and having a sectional area of 1.6 square inches; so that the resistance which this circuit presents to the passage of a current, when compared with that of the liquids in a voltaic battery, is practically null. When the coil is in full action it will melt 15in. of thin iron wire 035in, in diameter, or the same length of in. iron rod with equal certainty; and will electrolize acidulated water in at least 16 voltameters in series: so that the resistance outside the circuit, whether estimated by the 15in. of thin wire melted, or by the number of electro-

lizing cells in series, is more than 100 times greater than that of the coil in which the current is generated.

Moreover, the author has found that whenever a voltaic battery and a magneto-electric machine will melt an equal length of wire, the power which these electro-motors have to overcome external resistance, as measured by the number of voltameters in series, is also equal. And generally the power of an electro-motor (whether voltaic or magneto-electric) to overcome external resistance. is directly proportionate to the length of wire which it will melt.

From a consideration of these results it will be seen that one of the fundamental elements which enters into the theory of Ohm is found wanting when that theory is applied to the estimation of the magnitude of currents generated in circuits entirely metallic. M.M. Jamin and Roger, in a recent number of the "Comptes Rendus" of the Academy of Sciences, have also pointed out the discrepancy here referred to in the application of Ohm's theory to magneto-electric circuits. The author is, however, by no means prepared to admit the correctness of the views advanced by these physicists in their endeavours to reconcile facts observed, with established besides which, other anomalies present themselves when the customary formulæ are applied to magneto-electric circuits, a consideration of which must, as the author affirms, lead ultimately to the enunciation of laws much more general in their application than those with which we are at

#### THE PROJECTED MERSEY TUNNEL AND RAILWAY.\*

#### BY SIR CHARLES FOX.

AS a means of intercommunication between Liverpool and Birkeuhead, a tunnel beneath the sey has been under consideration by leading men on both sides of the river for upwards of thirty-eight years; and when the inconvenience and loss both of time and money which the want of such a means of transit has ever occasioned are considered, it is, in these days of increased facilities, a matter of surprise that, while works of real difficulty have been carried to completion on every side, this obvious want should not have been satisfied. There is but one should not have been satisfied. There is but one opinion as to the importance of intercommunication between Liverpool and Birkenhead, and it being admitted that the great obstacle in the way of its realization is the doubt existing in the public mind as to the cost at which it can be attained, it has been felt that this doubt can never be overcome unless the extense of the given bed in the great of the gr nature of the river-bed is conclusively proved.

When this has been done, I am sure that the construction of a tunnel through the red sandstonerock under the Mersey will be found an easy and rock under the Mersey will be found an easy and inexpensive operation, as, judging from the many similar works which have been executed in this nek during the last forty years (those most analogous having been tunnels of various dimensions carried on at considerable depth below the level of the bottom of the river, with a view of obtaining a more copious supply of water for the town of Liverpool, these hour accepting that have no accepting the second carried and the second carried of the second carried and the second carried and the second carried carried and the second carried carried and the second carried carried carried and the second carried it has been ascertained that in no material can such works be effected at so small a cost as through the very strata now well known to exist in this locality. very strata now well known to exist in this locality, the amorphous nature of the rock rendering it peculiarly advantageous for tunnelling operations. Tunnels have been made at a low price through chalk, as that material is readily excavated; but from its general looseness and its consequent tendency to fall, it is deemed necessary, for the purpose of ensuring safety, to put in brick or stone lining, and this, as compared with red sandstone, which generally requires no such lining, considerably augments the cost; and it must not be forgotten that the sandstone, when excavated from a tunnel in or near a town, is saleable for use as buildtunnel in or near a town, is saleable for use as building material; while chalk, taken from a tunnel, being of no value, is more generally run to spoil.

It would appear that one of the most formidable hindred in the contract of the most formidable in the contract of the most formidable.

hindrances in the way of getting capitalists to embark their money in making tunnels under rivers, of which very many are urgently needed, arises from the disposition which undoubtedly exists to form an unfair comparison between such works and the Thames Tunnel, which, as every one conversant with the circumstances connected with it will know. cost a very large sum, although passing under a river of no considerable breadth. This, however, is no fair criterion upon which to judge of any other case. This tunnel was constructed some forty years case. This tunnel was constructed some within the science of tunnel-making was since, when the science of tunnel-making was since, when it had to be applied little understood, and when it had to be applied upon a very limited scale, without the advantages arising a very limited scale, without the advantages along from many later improvements, and without the ex-tensive experience derived during the last forty years from works of this nature, required in the develop-ment of the railway system all over the world.

(\* Quarterly Journal of Science.)

This makes a comparison deceptive, to say nothing of the Thames Tunnel having to be constructed under all the difficulties of passing, not through London clay, which it would have done had it been placed a few feet deeper, but through the treacherous and loose silt and gravel of the bed of the river Thames, while the tunnel which forms the subject of this paper will pass through solid rock.

Thames, while the tunnel which forms the subject of this paper will pass through solid rock.

To attempt to draw a comparison between this project and the Thames Tunnel is but to show an entire want of acquaintance with the relative circumstances of the two cases, for it must be borne in mind that the Act authorizing the construction of the latter received the Royal Assent on June 24, 1824, more than forty-four years since, and that the tunnel was not opened for passenger traffic till March 25, 1843, having occupied a period of eighteen years and three-quarters in arriving at completion. Were this work now taken in hand by an engineer possessing the experience obtained in an engineer possessing the experience obtained in constructing tunnels since the period above referred to, taking care to place his work deep enough to let it pierce only the London clay (to have done which the present tunnel ought to be 15ft, deeper than it is) no present tunnel ought to be 15ft, deeper than it is) no doubt the entire work could be completed for little more than a tithe of the cost (which was £454,700), and need not certainly occupy a longer period than two years, as is proved by the following facts:—

facts:—
The excavation for the Thames Tunnel commenced in December, 1825, and all went on satisfactorily until May 12, 1827, when, the upper portion of the works protruding above the London clay into the gravel and silt of the bed of the river, the first irruption of water took place, there being then a length of 545ft, of the tunnel constructed, which had bett does into revised of seventeen mostles. been done in a period of seventeen months; so that, had no casualty occurred, and assuming that the rate of progress was not, as it no doubt would have been, augmented by the natural increase which always follows a better knowledge of any work, the ways follows a better knowledge of any work, the whole 1,200ft. would have been completed within three years and two months; and this, be it remembered, would have been the result if made wholly from one end; whereas, with the present increased facilities and knowledge of the operation, it would have been carried on from both sides simultaneously, when, even at the then slow rate of simultaneously, when, even at the then slow rate of progress, the time would be reduced to one year and seven months; so that there can be no doubt that, with present appliances, the work of the tunnel could, with perfect ease, be completed in one year and a quarter; and taking for the shafts and other matters, say, half a year more, the whole could with convenience be accountlished in one year and these. convenience be accomplished in one year and three-

In order to clear up every doubt, I propose, at an estimated cost of £20,000, to drive a heading under the Mersey from shore to shore, a distance of 1,300 yards, and thus not only to prove the practicable nature of the larger and more complete undertaking. but also the future cost, whilst at the same time

but also the future cost, whilst at the same time providing the necessery drainage and ventilation for the permanent works. The first operation will be to sink a shaft on either side of the river, on land belonging to the Mersey Docks Board, to a depth of about 120ft. below the surface.

The shaft on the Liverpool side will, for a depth of say 40ft., pass through made ground, and will then enter, and for the remainder of its length be entirely through the solid rock. That on the Birkenhead side will be in solid rock throughout.

These shafts will be about 10ft. in diameter, and will These shafts will be about 10ft. in diameter, and will These shafts will be about 10ft. in diameter, and will terminate in large sumps for pumping purposes. At each will be erected permanent pumping engines and pumps of sufficient power to deal with the largest quantity of water that is likely to be met with, and which pumps will not only be used during the construction of the works, but be adapted for keeping the main tunnels permanently free from water. Winding engines will also be erected of sufficient power, not only to deal with the material excavated from the heading, but also with that from the tunnel itself.

itself.

The shafts having been sunk to the full depth. The shafts having been sunk to the full depth, and the machinery fixed, the heading will be commenced from either end, and driven much in the same way as an ordinary mining water-level. It will have a very slight rise towards the middle of the river, so as to drain both ways into the shafts. Judging from experience, I expect that, at least four yards lineal a-day will be driven at either end, giving a total of 160 working days, or thereabouts, for the completion of the heading after the shafts are sunk. I have taken much pains to collect evidence as to I have taken much pains to collect evidence as to the nature of the rock through which the heading will pass, and have found everyone conversant with the subject unanimous upon the point. The general result of my inquiries and observations cannot be more forcibly explained than by the following summary of evidence given before the Referees of the House of Commons in 1865.

The late Mr. Thomas Duncan, then engineer to the Liverpool Water Works, stated that he knew well the nature of the rock, which is not very porous. He did not think the quantity of water produced from the rock at Birkenhead and Liverpool would make the tunnel a difficult work of construction, and he did not believe there would be any difficulty in

carrying it through so far as water is concerned. He considered that the "faults" existing in the sandstone rock, and shown on the geological map, were advantageous, as he had cut through many of them (having excavated in the red sandstone at various points over sixty square miles) and had nearly always found them filled up with a species of concerne which water waterly water tight. In a few concrete, which was perfectly water-tight. In a few instances, however, he had found them filled with laminated rock, having a saccharine appearance, and evidently having been subjected to a great heat, and vet water-tight.

yet water-tight.

Mr. James Abernethy, C.E., stated that having been engineer to the Birkenhead Docks, he had large experience of the sandstone rock, and that the rock under the river is good hard red sandstone rock, of the same character as the rock excavated from the Birkenhead Docks, which is a close, compact, strong stone, suitable for building purposes. Mr. John Fowler, C.E., stated that in framing his estimates he had well considered the question of possible faults in the rock, and, on the whole, preferred to have faults of the character known to exist in the red sandstone at Liverpool and Birkenhead, as they, being impervious to water, back up and limit in area the water contained in the interstices of the rock. The faults are filled either with clay or with some The faults are filled either with clay or with some vitreous material. Mr. Fowler further stated that he considered red sandstone at all times the best

he considered red sandstone at all times the best material to construct tunnels through.

Besides the above testimony, there is the further fact that Mr. John Hawkshaw, C.E., F.R.S., proposes to construct a tunnel under the Mersey, near its mouth, where the river is very wide and the character of the rock less certain; and it is therefore evident that engineers of emignee are greed. character of the rock less certain; and it is there-fore evident that engineers of eminence are agreed in considering the work of making a tunnel thoroughly practicable, and that at a moderate cost. As much doubt has been expressed as to the possibility of driving the heading for any such sum as £20,000, I would remark that the trustees have before them a tender from a responsible contractor who is prepared to undertake to complete the work considerably within that amount, finding all considerably within that amount, finding all necessary plant and machinery, and giving approved security to the extent of £5,000.

In driving the heading a boring-rod would, as usual in water bearing strata, be kept ahead of, and at the top of, the work, and thus due notice would at once be given of any unusual feeder of water, should such exist. All ordinary cracks in the sandstone are readily made water-tight by the use of a "feather" readily made water-tight by the use of a "feather" wedge of timber tightly driven into them. If a large crack were met with, containing water (a most unlikely thing, as has been already shown), a lining of iron would be put into the heading and pushed forward, as the excavation proceeded, until the fault was passed. The heading will be circular, and 6ft. in diameter. It will, when completed, be available not only for draining the tunnels, but for telegraphic purposes, and probably also for conveying water from the Welsh lakes to Liverpool, thus avoiding a lengthened detour and most expensive works.

from the Welsh lakes to Liverpool, thus avoiding a lengthened detour and most expensive works.

The heading having been successfully driven, I am confident that there will be no difficulty in letting a contract for a double line of railway under the river Mersey for £100,000, which would, indeed, give a price of £77 per lineal yard of tunnel—the work being through good hard sandstone and thoroughly drained by means of the heading; whereas £60 a lineal yard is a large price for tunnels even through clay, where, of course, heavy lining. even through clay, where, of course, heavy lining, including an invert, is required. The river tunnel being completed, the remaining works necessary to bring the two towns of Liverpool and Birkenhead into complete communication with each other will be of a very ordinary kind, and free from any unusual contingency.

# TO CORRESPONDENTS.

THE MECHANICS MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANIC, MAGAZINE Office, 166, Fleet-street, London.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday avening.

Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

Advertisements are inserted in the MECHANICS' MAGA-ZINE, at the rate of 6d, per line, or 5d, per line for 13 inser-tions, or 4d; per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise-ments.

ments.

MR. J. G. WINTON.—We do not know the name of the engineer whose scheme for tunnelling under the Channel was recently submitted to the Emperor of the French.

RECEIVED.—J. B.—H. T. and Co.—G. E. P.—J. G. W.—

E. B.—R. and T.—A. W. and Co.—R. T. C.—H. H. W.—

E. B.—R. and T.—A. W. and Co.—B. T. C.—H. H. W.—

G. G.—A. C. P.—D. W. and Co.—G. E. P.—E. A.—G. S.—

G. W. H.—J. R. J.—G. M.—S. H.—C. E. B.—L. G. and Co.

—G. R. D.—J. R. and Co.—T. F.—I. O. E.—H. B.—L. P. O.

—W. B.—W. H. H.—B. T.—G. W. M.—E. M.—J. F. D.—

H. G.—A. B. and Co.—J. B.—R. M.—J. S.—R. H. S.—H. E.

—J. C.

# Meetings for the Week.

MON.—Royal Institute of British Architects,—Mr. W. Cave
Thomas on "Suggestions Towards a Science
of Proportion," at 8 p.m.
TUES.—Royal Institution.—Professor Grant on "Stellar
Astronomy," at 3 p.m.
THURS.—Royal Institution.—Professor Tyndall on "Light,"
at 3 p.m.
FRI.—Royal Institution.—Mr. Lockyer on "Recent Discoveries in Solar Physics," at 8 p.m.
SAT.—Royal Institution.—Mr. Deutsch on "Semitic Culture," at 3 p.m.

# Correspondence.

## SAVING LIFE AT SEA.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

-Permit me to suggest the possibility of life often being saved at sea, if there were means of lowering persons into the boats in cases of necessity, by having on board ship a leather belt attached to a chain or rope, so that, with the belt fastened round a woman's waist, she would be lowered over the side by the chain or rope, run out, and have a chance of being picked up by those in the boats. When the being picked up by mose in the boats. Which the best was unbuckled the chain or rope could be wound up—as a measuring tape is. I am only sugesting a last resource, when to jump into a boat is only practicable for sailors—at much risk even for them.—I am, Sir, yours, &c.,

H. B.

# THE LONDON ASSOCIATION OF FOREMEN ENGINEERS.

SIR,—In the brief notice furnished you of the proceedings of the above-named Society at its May meeting, it was stated that Mr. E. J. Reed expressed himself on that occasion as opposed altogether to the patent system. This was certainly the belief of the officer of the Association who wrote that notice; but the disavowal of any such sweeping condemnation of the system by the Chief Constructor himself is sufficient evidence that the statement was inadvertently made. There could, of course, have been no intention to misrepresent that gentleman's remarks; and I am certain that neither he nor any reader of the MECHANICS' MAGAZINE will attribute the circumstance in question to any but its real cause.—I am, Sir, yours, &c.,

JOSEPH NEWTON.

Royal Mint, May 20. SIR.-In the brief notice furnished you of the

Royal Mint, May 20.

SIR.—I regret that any misunderstanding should have arisen as to the meaning of the remarks which fell from the lips of the Chief Constructor of the Navy, while discussing, at a recent meeting of the Association of Foremen Engineers, my paper on Iron Shipbuilding. As those remarks were necessarily summarized for publication, it was scarcely to be expected that the reports given of them in the scientific press would be in all respects exact. My own impression, however, was that Mr. Reed did say that he disapproved of patents generally, as well as of mine in particular. Of course, after that gentleman's explanation, in your last week's issue, it would be uncourteous not to admit myself to have been mistaken on the point in question. I cannot, nevertheless, do other than reassert that I have been somewhat badly treated by the Government in respect of my own patented improvements, in the mode of con-SIR.-I regret that any misunderstanding should what badly treated by the Government in respect of my own patented improvements, in the mode of constructing iron ships. It is an indisputable fact, that I first invented and introduced the system of connecting the keel and keelson with the stem and sternpost, which is now adopted in the building of every war ship of the British navy. Equally true is it, that my improvements have produced no advantages to myself, in a pecuniary sense, whilst, on the contrary, I have sustained heavy losses in defending what I considered to be my patent rights. That Mr. Reed would be the very last ment of imputation and residence in the ments of considered to be my patent rights. That Mr. Reed would be the very last man to dispute the merits of an invention or an inventor on other than conscienan invention or an inventor on other than conscientious grounds, I am assured; but, I think, in my case, he has overlooked some of the facts, and, without wishing it, has done me injustice. The peculiar mode of affixing stem and sternpost to keel and keelson, which is the characteristic of my patent, is what I claim credit for, and not the mere fact of making that connection by some means or other. It is not for me, on the present occasion, to trespass further on your space, but I trust you may find a corner for this brief rejoinder.—Iam, Sir, yours, &c.

JAMBS RAE.

27, Fenchurch-street, May 19.

# Habal, Military, and Gunnery Items

On the 26th ult., the steamer "St. Elmo" exploded her boilers in Mobile Bay, Alabama, killing one of her officers and seriously injuring six other persons.

A BOARD of officers has been in session at the Washington Navy-yard several weeks past, for the purpose of selecting a breech-loading rifle to be adopted in the U.S. navy.



THE National Life-boat Institution has just received from the executors of the late Mr. Thomas Brown, formerly of the firm of Messrs. Longman and Co., a legacy of £500, duty free.

Mr. ROBERT WILCOX, of Melbourne, has prepared a model illustrative of a method invented by himself for using submerged guns for purposes of naval warfare, by running out a gun so as to project for a distance of 12ft. from the vessel's side.

WE hear that a contrivance by which the true magnetic line will be indicated in every latitude uninfluenced by local causes, and which will prevent or obviate the variation of the compass, has been discovered at Graff Reinet. The discoverer is on his way to England to secure the patent.

THE "Somersetshire," gold ship, which has just arrived in England, held on her outward voyage a bazaar in aid of the Belvedere Institution, realising ten guineas; and on her homeward passage, on the 1st of February, a second bazaar, in aid of the Mer-chant Seamen's Orphan Asylum, realized £48 4s. 2d.

THE board of which Rear-Admiral Goldsborough is president, now in session at the Brooklyn Navy-yard, has a work before it of great magnitude. It is no less than to discover the errors of the old Steam Bureau, and to recommend plans for remedying them.

The new steamship "America," of the Pacific mail line, will sail from New York on a trip round the world, on or about the 1st of June, and will return to New York by the middle of November. Fare, 1,230 dollars, with the privilege of living on board while in port. The burden of the "America" exceeds 4,000 tons.

THE Aucient Order of Foresters has forwarded an additional contribution of £440 to the National Life-boat Institution on account of their second life-boat, which is to be launched in Sunderland in the beginning of August next, in the presence of some thousands of Foresters, who are to assemble on the occasion from all parts of the north of England.

FUETHER trials of the new bronze field gun for India were made on Monday and Tuesday last at Shoeburyness, with a continuation of very satisfactory results. The light iron carriages are perfect in their endurance. Case shot was also fired from the light Abyssinian steel gun at 200 yards, the effects of the bullets being severe upon the wood targets.

At the Washington Navy-yard a large number of At the Washington Navy-yard a large number of workmen are busily engaged in preparing the monitor "Saugus" for sea. A full and thorough cleansing and repairing has been given her. As soon as the "Saugus" leaves, the monitor "Mahopac" will be hauled in and completely overhauled and repaired, and prepared for sea. The purpose of the Department is to save the monitors from going to decay, as they are likely to do if left as they are.

An estimate was recently obtained by a New York shipping firm, for the building of a first-class iron sailing vessel in this country, but it now appears that the vessel is to be built in New York, more that the vessel is to be built in New York, more favourable terms having been obtained there, and that only the wire rigging, anchors, and chain cables, are to be supplied from England. This, we understand, will be the first American built iron sailing vessel to cross the Atlantic.

THE new King of Siam is busied with the organi-THE new King of Siam is busied with the organization of his army, and has named as the commander in chief of the Siamese troops a Frenchman, M. Ganier d'Abin, who served formerly in the national Polish army with the rank of colonel, and particularly distinguished himself during the insurrection of 1863-1864. The Siamese infantry is to be organized on the French system, and will comprise divisions, brigades, regiments, and battalions, with new arms. new arms.

THE departure of the German expedition to the North Pole is fixed for June 7. The "Germania" and the steamer "Harmonia" will proceed direct to the Island Jan-Mazen, and then go northward, and endeavour to discover an opening in the ice between the 74th and 76th degrees of latitude. If by the end of August the expedition should not have succeeded, the vessels will go and pass the winter either at Spitzbergen or at Gilsland, and resume the enterprise in 1870.

CER eminent name must be added to the long and Admiral Prince Alexander Menschikoff, of and Admiral Prince Alexander Menschikoff, of Crimean celebrity, died on the 1st instant, and was buried on the 6th with great pomp, the Emperor of Russia and several members of the Imperial family being present at the funeral. The deceased was eighty-two years of age, and had lived in retirement since the stirring scenes of the Crimean war, in which he was one of the chief actors.

passengers. Fifty have been burnt to death or drowned, and as many more injured. There was a drowned, and as many more injured. There was a large number of United States soldiers on board, who were coming down from the various military posts among the Indian tribes from the Upper Missouri.

Colonel George Gawler, K.H., died recently at Southsea, aged seventy-three. The deceased officer entered the army October 4, 1810, and served in the Peninsular with the 52nd Regiment, from November, 1811, until the end of that war in 1814, including the siege and assault of Badajoz, battles of Vittoria, Pass of Vera, the Nivelle, the Nieve, Orthes, and Toulouse, besides various minor affairs. He served also in the campaign of 1815, and was present at the battle of Waterloo. Colonel Gawler was wounded below the right knee, by a musket shot, at the storming of Badajoz, and in the neck, by a musket shot, at San Munos. He had received the war medal with seven clasps. war medal with seven clasps.

THE "Victoria and Albert," royal yacht, which has THE "Victoria and Albert," royal yacht, which has been in dock for some months, undergoing extensive alterations and repairs, is progressing rapidly, a great alteration having been made in her appearance within the last three weeks. The inner coats of planking over her frame are entirely completed, and the outside planking is nearly finished, while the works on board are also being pushed forward, so that she may be ready for engine work at an early date, when she will be removed into the steam basin, the dock being, it is understood, required for a new turret ship (the "Devastation") which is to be built there. The "Victoria and Albert" will not be ready for ese until the summer of next year. for sea until the summer of next year.

ANOTHER veteran of the "Great War" has departed. Admiral Bateman Dashwood died suddenly at Geneva on the 9th inst., in the 80th year of his at Geneva on the 9th inst., in the 80th year of his age. The gallant officer entered the service in 1799, and served uninterruptedly till the peace of 1815. He was a midshipman in the "Defiance" at the battle of Copenhagen, under Lord Nelson. In 1811, he was first lieutenant of the "Active," then commanded by the late Sir James Gordon, G.C.B., and when that officer fought and took the French frigate "Pomone," after a desperate contest. When Sir James had his leg shattered by a cannon shot, Lieut. Dashwood took the command of the "Active" until he himself lost his arm, and the French ship finally struck to the third lieutenant. third lieutenant.

# Miscellanea.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending May 15, was 3,534. Total number since the opening of the Museum, free daily (May 12, 1858). 1,563,870.

THE name of the thimble is said to have been derived from 'thumbell,' having been first worn on the thumb, as the sailor's thimble still is. It is of Dutch invention, and was brought to England about the year 1605, by John Lofting, who commenced its manufacture at Islington.

THE Fairbairn Engineering Company have now in hand, and will be shortly ready for exhibition, a set of 60-horse engines, constructed upon an entirely new principle, which, besides possessing other important advantages, will consume probably less than half the quantity of coals required by the best steam engines at present in use.

Advices from the south of France relate that an enormous amount of damage has been done by the hall in the department of the Aude, twenty-five communes having been devastated, with a loss of nearly a million and a-half of francs. The arrondissement of Muret, near Toulouse, has also been laid waste to an extent of five kilometres.

THE council of the Society of Arts propose shortly to appoint a day for discussing any practical measures for improving the cab system in the metropolis. Any person who may desire to submit proposals for discussion are requested to communicate them in writing to the secretary of the Society of Arts, John-street, Adelphi, on or before Saturday, the 29th inst.

ONLY 106,000dols. have been appropriated by Congress this year for the survey of the great lakes on the northern frontier of the United States. This amount is much below the appropriation for 1868. It is proposed, however, to finish the survey of Lake Superior, and to continue the experiments to ascertain the supply and outflow of the water, by gauging the short straits or rivers connecting the lakes.

THE annual exhibition of the Bath and West of England and Southern Counties Agricultural Association, to be held at Southampton, commencing on since the stirring scenes of the Crimean war, in which he was one of the chief actors.

On the morning of April 24 the steamer "Uselda," while coming down the Missouri river, struck a snag near Sioux City, and began to sink. As she was gradually sinking, the water rose around the boilers, and they suddenly exploded, shattering the boat to pieces, and killing and wounding a large number of

THE total amount of money paid into the Inland Revenue in Great Britain and Ireland for the duty on fire insurances during the year ended December 25, 1868, was £964,514 6s. 6d. The sums insured by the various offices on farming stock—exempt from duty—in the same period amounted to £75,419,003.

The value of the steam engines exported in the first three months of this year was £294,478, as compared with £290,796 in the corresponding quarter of 1868, and £397,833 in the corresponding quarter of 1867. The demand for our steam engines in British India has considerably fallen off, probably because forwar learners, and the sentent of the sentent fewer locomotives are now required to be sent out for the great Indian railway lines.

THE Emperor Napoleon is having a villa built at Rome on the Palatine Hill. The ground has been bought from the King of Naples for a sum of 50,000 francs, and on the spot are found the remains of the Palace of the Cosars. Although the new erections are nearly terminated, excavations are still carried on under the direction of M. Rosa (a descendent of Salvator) who is the conservator of the prime. Salvator), who is the conservator of the ruins.

AT a recent Court of Common Council it was re-Ara recent Court of Common Council was re-ported that the new Blackfriars Bridge would be ready for opening in July next, and the Improve-ment Committee was requested to report as to the public ceremonial to be adopted to signalize the event. A suggestion that the Holborn Valley Via-duct should be opened on the same day was referred back to the committee. back to the committee.

THE Cosumnes Bridge, on the Western Pacific, will be a Howe truss, 600ft. long, and the trestle work immediately connected with it will be 800ft. long, while another piece of trestle work over a slough through which the waters of the Cosumnes run in flood time, will be about 300ft long, thus making an opening for the waters of the river of 1.700ft.

THE number of visitors to the South Kensington THE number of visitors to the South Kensugton Museum during the week ending May 15, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 11,967; Meyrick and other galleries, 2,061; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,624: Meyrick and other galleries, 205; total, 16,857. Average of corresponding week in former years, 11,206. Total from opening of Museum, 8,424,336.

On the 1st of June next, the tariff on Atlantic cable On the 1st of June next, the tariff on Atlantic caole messages will be reduced from £37s. 6d. for ten works, and 6s. 9d. for each additional word, to £2 for ten words, charging for address and signature, and 4s. for each additional word. An important reduction will also be made for newspaper press messages, and all political and general news will be conveyed from either side of the Atlantic at half rates. This will predice the press messages from 6s. 9d to 2s. practically reduce press messages from 6s. 9d. to 2s.

YESTERDAY week, at the weekly meeting of the Mersey Docks and Harbour Board, a letter was read from Messrs. William Low and George Thomas, civil engineers, proposing to connect the Lancashire and iverpool and Birkenhead. They propose to accomplish this by a suspension bridge of three spans, the centre being 1,800ft. in length, and the others 960ft. each, the bridge to be 140ft. above high-water mark. Estimated cost, £1,750,000.

apid strides every year, not only in quantity but in quality. From the report of the North German 

The Direction of the State Domain has during the last few days been selling by auction, at Paris, property abandoned in the railway stations or carriages. Nothing can be more curious than this collection of proofs of forgetfulness or negligence, comprising firearms, pipes, shoes, chignons, perfumes, jewellery, hardware, hats, bonnets, caps, shawls, mantles, &c. An immense number of travelling bags had been left behind, and the books forgotton would form a large library; there is also an enormous quantity of wines, liquors, and divers kinds of merchandise. liquors, and divers kinds of merchandise.

THE Royal Horticultural Society's last meeting was remarkable for many beautiful objects exhibited. Amongst the most prominent was a rhododendron named Beauty, from Mr. Standish; the Golden Osk, from Messrs. Lee, was also remarkable, and promises to be a great acquisition. A cut flower of Rhododendron Falconerii, grown in the open air in Mr. Lloyd Wynne's garden at Coed Coch, in Denbighshire, was also much admired. Mr. Wilson Saunders, F.R.S., presided, and the following candidates were elected follows.



THE French Atlantic cable is now completed with the exception of about 170 miles, and the whole will be ready in the course of noxt week. It is arranged, therefore, that the "Great Eastern," with the attendtherefore, that the "Great Eastern," with the attendant vessels, shall leave Sheerness on June 10, calling to coal at Portland, whence she will proceed to Brest, where she is expected to arrive on the 20th. From Brest she will immediately start for St. Pierre, off Newfoundland, while two other ships will sail for St. Pierre direct to lay the portion of the line between St. Pierre and Duxbury, Massachusetts. The land line from Duxbury to New York is already in course of construction. in course of construction.

On Tuesday evening, the 25th inst., Mr. Charles Hutton Gregory, the president of the Institution of Civil Engineers, will receive the members at his annual conversazione, to which he has invited all the leading celebrities of the day, many of whom may be expected to be present. During the session just concluded there have been added to the registry of this Institution one honorary member (H.I.M. Napoleon III., Emperor of the French, 30 members, and 82 associates, while the council have admitted 31 students. The numbers of the several classes now on the books are 17 honorary members, 664 members, 934 associates, and 143 students, or a total of 1,758 of all classes. On Tuesday evening, the 25th inst., Mr. Charles of 1.758 of all classes.

SIR CHARLES WENTWORTH DILKE died suddenly on the 10th inst., at St. Petersburgh, to which capital he had repaired as the representative of capital he had repaired as the representative of England at the forthcoming exhibition of the Russian Horticultural Societies. The deceased baronet was born on February 18, 1810, and was educated at Westminster, and at Trinity Hall, Cambridge. For a short time he studied law; but afterwards gave up his leisure to the affairs of three or four learned societies. He took a prominent part in the Society of Arts, of which he was for some years chairman of the council, and also in the Royal Horticultural Society, which owes no little of its public prosperity to his exertions. He was one of the first promoters to his exertions. He was one of the first promoters of the Great Exhibition of 1851, and acted as one of the executive committee.

# Patents for Inbentions.

### ABRIDGED SPECIFICATIONS OF PATENTS.

TATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES-3344, 3371, 3376
BUILDINGS AND BUILDING MATERIALS-3331, 3339, 3368, 2374

CHEMISTEY AND PHOTOGRAPHY—None.
CULTIVATION OF THE SOIL, including agricultural implements and machines.—None.
ELECTRICAL APPARATUS—3329
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—318, 3332, 3336, 3337, 3347, 3349, 3350, 3353, 3357, 3372, 3384
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—3323, 3361, 3367, 3378
FURNITURE AND APPARAUL, including household utensils time-keepers, jewellery, musical instruments, &c.—2317, 3322, 3326, 3327, 3334, 3340, 3345, 3355, 3365, 3375, 3382

GENERAL MACHINERY—3330, 3346, 3356, 3363, 3385 LIGHTING, HEATING, AND VENTILATING—3321, 3324, 3379 METALS, including apparatus for their manufacture— 3316, 3356

3316, 3356 MISCELLANEOUS—3319, 3325, 3333, 3341, 3343, 3348, 3352,

miscellaneous—3319, 3325, 3333, 3341, 3343, 3348, 3352, 3360, 3366, 3390, 3393

BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—3362, 3364, 3370

SHIPS AND BOATS, including their fittings—3320, 3328, 3352

STEAM ENGINES—3385 WARFARE—3335, 3381

WARFARE—3335, 3381

3316 W. Brown, Smethwick. Rolling metals. Dated October 20, 1868.

This refers to letters patent, dated September 12, 1867 (No. 2588). In the specification of those letters patent the inventor described two sets of parallel rolls driven at different velocities, the bar to be rolled being passed directly from one set to the other set, the second set moving at a rate greater than that of the first set, so as to receive the lengthened bar at the additional speed which its elongation requires. He finds that three or more sets of rolls similarly arranged and driven may be used with advantage, and one part of the present invention consists in the use of three or more sets of parallel rolls driven at different velocities. Another part of the present invention consists of an arrangement for driving the strand or roducing rolls. Instead of the toothed wheel, described and represented in the specification before referred to, the inventor employs a large toothed wheel on the shaft of the lower roll of the first pair of rolls. This toothed wheel takes into a pinion on the shaft of the middle roll of the second set of three rolls, and the last described pinion takes into a pinion on the shaft of the lower roll of the next pair of rolls, and so on through the whole series. The invention is applicable to the rolling of metals in general, but is especially applicable to the rolling of from and steel and copper and alloys of copper.—Patent completed.

3317 A. S. PATERSON, Cincinnati, U.S.A. Bool heels. ated October 30, 1868.

3317 A. S. PATERSON, Cincinnati, U.S.A. Boot heels. Dated October 30, 1868.
This consists in making heels of vulcanized rubber combined with two metallic plates, which are screw-capped to receive the point of a screw entered from the inside of the boot or shoe for fixing the heel thereto. The metallic plates are shaped in any convenient way to touch at one or more points, but with space otherwise for the rubber to extend between them. The rubber is cured with the two plates in it, these being riveted together and the rubber pressed into the mould with the plates in position, so as to solidly fill up the space between the plates as well as to occupy the remainder of the heel-shaped cavity.—Patent abandoned.

-Patent abandoned.

3318 W. COLLINS, jun., Glasgow. Separating paper.
Dated October 30, 1868.

The object is the automatic separation of paper or other sheets from a pile, and the feeding or removing of the sheets for various purposes, such as gumming or folding, to make envelopes, or embossing or printing, and the invention consists principally in employing a sucking mouthplece of a peculiar conformation, and in applying it so as to lift only one edge or corner of the sheet, and also in limiting the action of the sucker to mere lifting, gripping fingers. rollers, or equivalent details being used to remove the sheet after it is lifted.—Patent completed.

3319 G. WRIGHT. Sheffield. Printing presss. Dated

3319 G. WRIGHT, Sheffield. Printing presses. October 30, 1868.

October 30, 1868.

This consists principally of an improved printing or embossing press, which is worked by means of a lever with eccentric action on a piston, at the bottom of which is a pad of vulcanized india-rubber or other suitable material. Beneath this piston is a metal bed, on the face of which are dove-tailed slides to receive the dies, which, being made of a size to move freely therein, may be changed at will. At the back of this bed (in a rack in which are cut diagonal slots) are placed one or more rollers of suitable thickness, on which is wound carbonized paper or other material of such colour as may be desired the slots permitting the rollers to be at once changed, and other coloured rollers substituted.—Patent abandoned.

3320 G. ALLIX, Southampton. Raising and lowering boats Dated October 30, 1868.

3320 G. ALLIX, Southampton. Raising and lowering boats. Dated October 30, 1868.

This consists, first, in an improved arrangement of apparatus for raising ships' boats from and lowering them into the water; and, second, in improved arrangements for disengaging the boats when so lowered. From the davit heads brackets or frames are suspended, in which bearings are formed for a spar, on the ends of which are barrels to receive the hoisting and lowering chains or ropes. On one end of the spar is a toothed wheel driven by a pinion on the same axis as another wheel driven by another pinion, which last pinion is on the axle of a driving pulley, round which a rope or parbuckle is wound. By hauling on this parbuckle the spar is caused to rotate, wind up the hoisting chains, and thereby raise the boat. By leaving the parbuckle free to wind on its pulley, the weight of the boat causes the spar to rotate in the contrary direction, and thereby to let the chains run out and lower the boat. The arrangement for disengaging the boat when it reaches the water is a self-acting arrangement, and is intended to prevent the hook at one end of the boat boat touches the water first. It consists in the employment of two counterbalanced hooks, one at each end, rigidly fixed to a fore and aft bar, to which the hoisting and lowering chains are attached. These hooks take into eye or ring bolts in the boat, as usual, and when the weight or strain is taken off the chains by the boat touching the water the counterbalanced hooks turn simultaneously with the fore and aft bar, and become released from the bolts.—Patent abandoned.

3321 S. Sharrock, Liverpool. Lamp posts. Dated October 30, 1868.

3321 S. SHARROCK, Liverpool. Lamp posts. Dated October 30, 1868.

The inventor employs a taper formed of a sheet or sheets of wrought iron, bent round and with the edges riveted together along the side of the tube. He also places stays or hoops in these posts to strengthen them at points where they would be liable to collapse. The post at its lower end may be inserted directly into the ground or into socket of east iron, or an ornamental base, for the post may be formed of cast iron; this base rests on the surface of the ground, and the post passes through it. The base serves to steady the post, as well as to give it a more ornamental appearance. The top of the post receives a socket which carries the lanthorn, or the lanthorn may be attached in any other way.—Patent completed.

3322 W. E. DANDO, Manchester. Mourning hats. Dated

October 30, 1868.

This consists in covering the upper portion of the body of the hat with silk or any such material as may be commonly used for hats, and covering the lower portion with cloth or any such suitable material as may be made to represent a mourning band, so that the cloth forms a portion of the hat itself, being fixed direct to the body of the hat during the process of manufacture.—Patent abandoned.

3323 R. IRVINE, Leith, N.B. Alcoholic liquors. Dated October 30, 1868.

This relates to the economizing and utilizing of those refuse products containing starch, which result from the process of brewing and distilling, and has for its object the production of sugar from such refuse products, to be afterwards converted into alcohol by fermentation. In carrying out his invention, the inventor takes any of the before mentioned refuse products and adds thereto water acidulated with sulphuric acid, or such of its saits as have an acid reaction, which are most suitable for the purpose. The proportion in which he employse either the acid or the acid salts will vary according to the amount of starchy matter contained in the refuse products, the object being to convert the same into starch sugar, or partly into starch sugar, and partly into dextrine. This saccharine material the luventor designates, for the sake of convenience, "matt extract," from its similarity in proporties to that substance as obtained from malt.—Patent abandoned.

3324 J. Bronner, Frankfort-on-the-Maine. Gas shades.

Frankfort-on-the-Maine. Gas shades

3324 J. BRONNER, Frankfort-on-the-Maine. Gas thades. Dated October 31, 1868.
This consists in so constructing a shade that when applied to a gaslight, the jet will burn at a certain regulated distance from a vertical or nearly vertical plane, the expansion of the flame being parallel therewith. The effect of this construction and arrangement is that this flat vertical side of the shade becoming heated, a perpendicular current of hot air is produced, steadying the flame,

and doing away with the wavering so injurious to the eye, and to which the fiame from batswing and fishtail burners is specially subject.—Patent completed.

and doing away with the wavering so injurious to the eye, and to which the flame from batswing and fishtail burners is specially subject.—Patent completed.

325 W. E. BATS and T. Dond, Northwich. Cracking nuts. Dated October 31, 1868.

This relates, first, to improved machinery employed principally for the purpose of cracking palm nuts in order to remove the shells previously to their being submitted to the press for extracting the oil. Second, to improved machinery for separating the kernels of the nuts or fruits from the husks or shells after having been cracked. The inventors construct an ordinary centrifugal fan or pump consisting of a disc with blades, fans, or leaves attached to its periphery revolving round an axis in a barrel or case of sheet iron or other metal. At the points where the water is conducted into the ordinary centrifugal pump, they introduce the nuts or other fruits required to be broken, which for this purpose are contained in a hopper placed above the machine. The blades, fans, or leaves exactly fill the interior of the barrel or case, as, if any space were left, the nuts would accumulate and choke the machine. The disc and blades are then caused, by steam or other motive power, to revolve at a great speed. The blast or current of air generated by the rapid revolution of the disc and blades, and, aided by the centrifugal force, also generated thereby causes the nuts or other fruits to fly off with great force at a tangent slong a discharge or exit pipe. A perpendicular or slightly inclined target or shield of metal or wood is erected at a convenient distance from the fan, and in front of the mouth of the exit pipe. The space between this target and the mouth of the exit pipe is boxed in to prevent the broken shells and nuts from flying about. The nuts or other fruits to be cracked are driven with great force against this target, and are consequently broken, falling down immediately in front of it into a convenient receptacle. The second part of the into a form the husks or shells after b

centringal force generated by the revolutions, and endearour to escape through the apertures or perforations.—
Patent completed.

3326 A. M. CLAEK, Chancery-lane. Seeing machines.

(A communication). Dated October 31, 1868.

This consists, first, in acting on one or more of the
principal parts of a sewing machine in a direct manner by
means of a receiver or receivers of the electro-motive
power which is transmitted from any suitable battery.
Second, in making said receivers independent or acting in
combination as desired, and according to the arrangement of the machine used. Third, in dispensing in this
manner with the friction inherent where the motion is
transmitted by gearing. Fourth, in simplifying and reducing the cost of the machine. Fifth, in combining in
one machine both the receiver and the sewing mechanism.
The power of the receiver is applied direct to the sewing
mechanism, viz., the needle carrier, hook or shuttle wheel
or other feeder, thus producing a sewing machine of
essentially novel arrangement, as regards the mode of
operating the working parts. The parts being thus
arranged, a maximum effect is obtained from the electric
receivers with a given amount of fuid.—Patent completed.

3227 J. Langford, Birmingham. Teapot handles.

receivers with a given amount of nuid.—Fatent completed.
3327 J. LANGFORD, Birmingham. Teapot handles.
Dated October 31, 1868.
Rings of porcelain, or other imperfect conductors of heat, are inserted between the ends of the handle and the teapot or other vessel, or between the part of the handle which it is wished to protect from heat and the other part to which it is wished to protect from heat and the other part to which it is joined.—Patent abandoned.

part to which it is joined.—Patent abandoned.

3328 B. DICKINSON, Hope Town, India. Propelling essels. Dated October 31, 1868.

The inventor employs trough plates or channels, running longitudinally, to prevent the lateral diffusion of the water as it issues from the jet or discharge pipe at the bottom or sides of the vessel, such apparatus being placed, in every case, below the water line, and forming placed, in every case, below the water line, and forming placed, in every case, below the water line, and forming placed, in every case, below the water line, and forming heat rough plates or channels may be either straight in their vertical depth, or curved or angled, so as to regulate more perfectly the direction of the flow and discharge of water. In some cases, also, instead of being parallel to one another, the trough plates or channels are made to angle outwards towards the stern of the vessel, in order to admit of a freer course and to reduce the friction. The openings for the emission of the water may be placed either directly under the centre line of the vessel, or on the other side of the keel.—Patent completed.

3329 S. A. VARLEY, Holloway. Generating static elec-

3329 S. A. VARLEY, Holloway. Generating static elec-ricity. Dated October 31, 1868.

3329 S. A. Varley, Holloway. Generating static electricity. Dated October 31, 1868.

This consists in so treating glass tubes or cylinders as to prevent the condensation of moisture on the inner surface, and also in so constructing them as to obtain a much greater exciting surface in a given space than with the ordinary construction of frictional electrical machine, when he desires to develope large quantities of electricity, of a series of glass tubes; into these tubes he pours hot melting cement, which he prefers to consist of 32 parts Stockholm pitch, 16 parts black resin, and 4 parts of becawax. The object desired is to cost the inner surface of the glass with an electric which does not attract moisture. Sulphur or parafin may, in some cases, be substituted for the cement above described. These tubes are mounted on bearings, and arranged in one plane, and are made to revolve by means of a band passing round pulleys attached to the glass tubes and driven by a multiplying wheel, or by any other suitable means. Bubbers coated with amalgam, similar to those used for the ordinary frictional electrical machine, pressed against the one side of the revolving glass tubes, and collecting points in metallic connection with an insulated conductor are arranged on the opposite side over the glass tubes.—Patent abandoned

3330 A. Muuso and W. B. Adamson, Glasgow. Manactive of tools. Dated October 31, 1868.

Taus relates, in the first place, to the employment of



creosote or hydrocarbons for the purpose of making tools and other articles composed of iron, steel, or metallic alloys, much harder and more thoroughly tempered than hitherto. The tools or other articles to be hardened or tempered are heated to the necessary temperature and cooled by immersion in the creosote or hydrocarbon, and to further increase the hardness or temper of the tools, or other articles, carbon, or other indurating substance, may be mixed with it. The invention relates, in the second place, to the manufacture of iron, steel, and metallic alloys or tools, or other articles composed of iron, steel, or metallic alloys, and it consists in treating the iron, steel, or metallic alloys are melted and rendered dense and hard by being cast in chills, the chilled iron, steel, or metallic alloys are melted and recast into chills, the result being the production of a much harder, denser, and more durable material than hitherto obtained.—Patent abandoned.

3331 S. Ault, Bridgtown. Trowels. Dated November 2.

1868.

The inventor makes the holder of two uprights or tangs, between which a scrow pin or rod is secured near their tops. This pin or rod carries the wooden handle, by which the holder is grasped while using the trowel. On the bottom ends of the uprights, and made in one piece therewith, is a dovetail or connecting plate, which has a taper figure that is wider at one end than at the other. On the upper side of the steel plate of the trowel, a hollow dovetail or seat is fixed of a size and figure suited to receive the taper dovetail on the bottom of the holder.—Patent completed.

8332 J. LODGE, Yeadon. Looms. Dated November 2,

1868.
This consists, first, in connecting each weft fork rod the knocking-off lever by a swivel or joint, and applying a bracket to the breast beam to guide the fork straight or in a right line when acted upon. Second, in the application of a spring "brig" or bridge to each weft, fork, race, or recess in the batten or "going part" of looms where wheel shuttles are used, which "brigs" are lifted even with the surface of the shuttle race, by suitably formed incline plates, fixed to the loom end, so that the said fork, races, or gaps in the batten or shuttle race, are filled up at the time when the shuttle is passing over, and as the "going part" moves forward towards the cloth, the inclines cease to act on the "brigs," and the springs act to sink them into the recesses to pass under the forks.—Patent abandoned.

8333 F. T. LABITTE, Paris. Advertising. Dated Novem

ber 2, 1868. This consists in applying addresses, advertisements, notice, and illustrations, to articles of various kinds and forms, made of ceramic materials, glass, and crystal, either by drawing or painting, by caligraphy printing, autography, or lithography, or by photography, or engraving, or by any other like process.— Patent abandoned.

other like process.—Tatent abandoned.

3334 J. Dannatt and T. S. Turnbull, Sunderland, Safety garment. Dated November 2, 1868.

This consists principally in an inside double lining, which is applied to the jacket or other garment, forming an air chamber. It is made of india-rubber or other air-proof material, and is provided with a flexible tube, having a mouthpiece with a valve opening inwards, by means of which the wearer can at any time inflated it when required. After the jacket or other garment has been inflated, the air is kept inside the same, and is prevented from escaping by turning a screw attached to the mouthpiece. A broad hem runs round the bottom, breast, and arm holes (of the jacket, for example), for attaching it to the outside and inside lining of the garment without perforating the air chamber.—Patent completed.

3335 J. VAVASSUR. Southwark. Discharging ordnance.

3335 J. VAVASSEUR, Southwark. Discharging ordnance. Dated November 2, 1868. The inventor introduces into the outer end of the vent.

the inventor introduces into the outer end of the vent, which is suitably chambered to receive a capsule like the case of a cartridge for a breech-loading rifle. This capsule is provided with a percussion priming, and is loaded with a charge of gunpowder or similar explosive material sufficient to produce the volume of fiame required.—Patent completed.

33?6 J. H. BERTIE, Nottingham. Lace. Dated November 2, 1868.
In order to obtain a net like the ground of hand-made.

, 1868.
order to obtain a net like the ground of hand-made In order to obtain a net like the ground of hand-made blond, the inventor employs a complement of threads consisting of one warp thread to each bobbin thread, and he uses four of these threads, that is to say, two warp threads and two bobbin threads, to produce each pillar of the ground net. This is not in itself new, but according to the invention the crosses are made from pillar to pillar in such next, having two bobbin threads and two warp threads in each pillar.—Patent completed.

threads in each pillar.—Patent completed.

3337 J. Moorr, Moston. Woren fabrics. Dated November 3, 1868.

This relates to an improved manner and method of laying the weft in the shed, and consists, first, in laying the weft more openly in the shed by preventing the different folds from twisting round each other, and also by preventing one fold from riding on the other. Second, in the increased facility afforded of mixing the weft, and also of introducing a change in the nature or kind of weft. To accomplish this it has bitherto required the use of the pick and pick loom. The means adapted for this purpose consist in the use of two shuttles, the shooting of two picks from each in succession, and in putting two picks, as before, into the same shed; but in starting, an odd pick only is to be used, and this is accomplished by removing the bottom shuttle from its box and placing it at the single end of the lay, and then picking it back into its proper box; the boxes which were raised to admit of this are then dropped, and the top shuttle is passed through the same shed in the body of the warp as that in which the previous or bottom shuttle was passed.—Patent abandoned.

doned.

3338 L. Berenger, Paris. Ironing and pressing. Dated November 8, 1868.

The inventor suspends the iron to be used on a frame carrying rollers or wheels, which travels on rails or a platform, fixed above the cloth or material to be ironed or pressed. He suspends the iron to this frame by a screw or other mechanical appliance, which serves to lift the iron from the material to be operated upon, and to give any desired pressure by means of the iron upon the said material.—Patent completed.

2320 1 and R. MAIN Glasgow. Iron shell. Dated No.

3339 J. and B. MAIN, Glasgow. Iron sheds. Dated No ember 3, 1868.

This consists in arranging a light roofing of corrugated

or other suitable sheet iron so that it can be adjusted at various heights, to suit the quantity of produce stacked or placed under it.—Patent completed.

3340 E. BARTON, Robinson-road, N.E. Scarves. Dated

3340 E. BARTON, Robinson-road, N.E. Scarves. Dated November 3, 1868.

This consists in a plain broad flap of any suitable material, and of one piece, passing down in front of the shirt, the lower end being, by preference, made much narrower than the upper part, which flap is secured round the neck by means of a band attached thereto.—Patent aban loned.

than the upper part, which dap is secured found the neck by means of a band attached thereto.—Patent aban found.

3341 S. Schuman, Glasgow. Utilizing fecal matters, Dated November 3, 1868.
In carrying this invention into operation with the existing system of water-closet, the pipe or shaft leading from the pan of the closet is contracted at its lower end and connected to a porous or perforated receptacle, formed, by preference, of straw basketwork, felted or other similar substance, knitted or woven, the lower part of which is in communication with a lower receptacle or reservoir. As soon as the fecal matter and water are discharged from the closet, these fall into the porous or perforated receptacle, and the liquids, water, and urin' drain through into the receptacle below. The lower receptacle is connected by a pipe with a large district reservoir, into which the urine, water, and all matter mixed with the fluids are discharged, and in which they are evaporated at the natural temperature, or by artificial heat, and the product separated from the refuse or water portions, or the liquid portions may be pumped off into movable tanks, and afterwards discharged and disinfected whilst the solid matter is retained in the porous or perforated receptacle, which is so fitted as to be capable of easy removal and replacement by attendants provided for the purpose.—Patent Abandoned replacement by attendants provided for the purpose. Patent abandoned.

Patent abandoned.

3343 G. F. Morant, Fenchay. Packing game. Dated November 3, 1868.

The case for this purpose is made of openwork material, so that the air circulates freely through it. Also, in order that no packing material, such as the heather now commouly used, may be necessary, means are provided for securing each head of game in its place in the package. The case is made of strong wirework supported on a suitable frame, furnished with eyes, by which it is secured to the pack saddle; or the sides of the case, if preferred, may be made of perforated zinc, and galvanized or painted. The case is fitted with shelves, the bottoms of which also are of wirework, and which may have fixed to them a number of straps with buckles or elastic bands, by which each head of game may be separately secured on the shelf.—Patent completed.

3344 W. R. Lake, Chancery-lane, E.C. Alarm appa-

3344 W. R. LAKE, Chancery-lane, E.C. Alarm apparatus for boilers. (A communication.) Dated November 4,

This relates to an automatic apparatus for indicating a deficiency of water in steam boders. The apparatus is provided with a whistle or other similar instrument, which is attached to a tube. The lower end of the tube is open and a little below the desired water line; when the water sinks below this line steam enters the tube, and by its heat expands the same. The upper end of the tube is closed and provided with a socket, which carries the whistle. The socket communicates with the steam space of the boiler, and is provided with a valve. The tube carries a lever, which is arranged to open the valve and sound the whistle when the tube is clongated. The lever is held by a rod, which is attached to the lower end of the tube, and whose length is not affected by the admission of steam to the said tube.—Patent abandoned.

3345 B. W. BECKLEY, Ludgate-hill, E.C. Pen rest. This relates to an automatic apparatus for indicating a

2345 B. W. BECKLEY, Ludgate-hill, E.C. Pen rest.
Dated November 4, 1868.
This consists in the application of an ordinary horse shoe or other shaped magnet, suitably mounted, as a pen rest, whereby the pen is rendered more durable, and the inking of the fingers, consequent on resting the pen in the ink bottle, is avoided.—Patent completed.

ink bottle, is avoided.—Patent completed.

3346 M. SAMUELSON, Hull. Pressing fatty substances.
Dated November 4, 1868.

This consists in so adapting an ordinary pair of rollers for rolling iron or steel or other ductile metal, that the desired parallel or tapered form of the plate, together with the necessary recessed form thereof, with corrugations or ridges and furrows across the said recess may be produced at the same time by the simple operation of rolling, and thus adapting them for the above purpose.—Patent abandoned.

3347 E. HOLDEN, Baildon. Preparing wool. Dated No-

rember 4, 1868.

The object of this invention is to operate more effec-The object of this invention is to operate more enectively upon the fibre and at the same time to reduce the number of operations upon it by passing it through apparatus arranged to effect a draft on such fibre, between sets of gill combs, and it is found convenient to employ drawing rollers as the means of effecting such draft between the sets of gill teeth.—Patent completed.

3348 A. V. NEWTON, Chancery-lane, E.C. Atmospheric cater elevators. (A communication). Dated November 4,

1898.

This consists, first, in constructing water-elevating engines with a double cylinder—that is to say, an upper and a lower cylinder, the latter of which is, properly speaking, the condensing cylinder. The invention also includes certain devices for condensing the steam (which is let into the upper cylinder to dostroy the vacuum and allow the water to fall to the level of the discharge valve), by the momentum of the falling water, which enables it to pass through a floating piston of the upper cylinder into the water in the condensing cylinder.—Patent abandoned.

3349 E. T. HUGHES, Chancery-lane, E.C. 3349 E. T. HUGHES, Chancery-lane, E.C. Furred threads and fabrics. (A communication). Dated November 4, 1868. This consists, first, in an improved system and mechanical arrangement for coating threads or yarns of wool and other fibrous materials with the hair or fur of animals, and afterwards employing them to form fabrics having all the appearance of real skins of fur, with their lightness, warmth, and peculiar aspect, and also for forming fabrics having plain or even surfaces: and, secondly, in forming furred fabrics by causing fur to adhere to a woollen or other fabric used as a foundation.—Pattent abandoned, 3350 J. W. and J. Hottr and J. Mayne, Balton (1964).

other rather used as a nonnamon.—rather abandoned.

3350 J. W. and J. Holt and J. Maude, Bolton. Spinning and doubling. Dated November 4, 1868.

This consists in dispensing with the ordinary drumbands and warves, and driving the spindles of such machinery in a novel manner by friction wheels, the periphery of the driving wheels of such frictional gear being parallel with the axis of the horizontal driving shaft, and

a weighted boss being secured to the lower extremity of the spindles covered with leather or other suitable mate-rial, cupped to the proper shape, so as to present a narrow or feather edge to rest upon the periphery of the driving wheel.—Patent completed.

wheel.—Patent completed.

3332 M. SAUTLER, Paris. Preserving substances. (A communication). Dated November 4, 1868.

This consists in using for this purpose the vapours which are disengaged by the distillation of the tarr of coal, wood, resin, or of natural tar, or of the mineral oils, such as naphtha or petroleum. These matters are distilled at a temperature of 100 kg, to 150 kg. Centigrade, or similar vapours may be obtained by distilling at a suitable temperature matters derived from those above mentioned.

—Patent completed.

2353 S. Ward and W. Hurst and J. Turr, Farnworth,

Patent completed.

3:53 S. Ward and W. Hurst and J. Turr, Farnworth, Looms. Dated November 5, 18:63.

This consists, first, in dispensing with the shoulder and stop, and in checking the shuttle by means of a check strap, which is connected to the shuttle box frame and to the front of the boun side. At the end of the shuttle when the drop box rises or falls. Second, in a positive taking apmotion with one plain roller. As the cross beam increases in diameter, it raises a lever which is moved to and fro by an eccentric or other equivalent on the second motion shaft or other part of the born; the lever moves the catch of the taking up ratchet wheel, and the speel there of is reduced in proportion to the increasing diameter of the cloth on tae beam.—Patent completed.

3354 T. Burt, Wandsworth-road. Floiting dredgers. (A

3354 T. BURT, Wandsworth-road. Floating dredgers. (A

3354 T. BURT, Wandsworth-road. Floating dredgers. (A communication) Dated November 5, 1863. The inventor makes a centrifugal mud pump by fixing two or more vanes to a shaft, and supporting it by suitable bearings; these vanes he partially encloses in a cylindrical case, having an outlet formed on one side, and an inlet on the top and bottom, the one on the top being furnished with a valve, and that on the bottom with a suction pipe. This pump, which may be worked by steam or other power, he supports upon a floating versed, and mounts it in such a manner as to admit of its having a radial monthly manner of the power of the power of the power of the suit of the side opening of the case, the inventor fixes flexible-jointed pipes, connecting the pump with the shore or place for depositing the material lifted.—Patent abandoned.

3355 H. JEWITT, Kentish Town. Tov houses. (A com-

attent.—Patent abandoned.

3355 H. Jewitt, Kentish Town. Toy house. (A communication). Dated November 5, 1868.

This consists in forming slabs or blocks for the erection of toy houses with mortice joints at one or both ends, sides, or margins thereof, so that the joints may fit into each other, by which means various styles of architectural buildings or structure, such as castles, churches, arches, temples, and many others, may be constructed in a more substantial and secure manner than with the present form of plain blocks. These slabs are preferably oblong or square, but they may be made of any shape to suit the style of building or erection for which they are intended.—Patent comming or erection for which they are intended.—Patent coming or erection for which they are intended.-Patent com pleted.

3356 T. ROBINSON, Widnes. Iron and steel. Dated Novem-

ber 5, 1868.

The object is to improve the quality of iron and steel by The object is to improve the quality of iron and steel by removing sulphur and phosphorus therefrom, and to facilitate the production of iron and steel of any desired quality. For this purpose, the inventor introduces into cupola blast or other furnace of that class, in which the body of the fuel is direct contact with the ore to be smelted, or the pig or other iron to be remelted, whether such furnaces are worked with a plenum blast or induced current of air, nitrate of sola, nitrate of potash, or other salt or salts with like properties.—Patent abandoned.

3377 R. COOK Hathersone Bellin reset, Patel March

3357 R. Cook, Hathersage. Bobbin spools. Dated November 5, 1868.

ber 5, 1868. This consists in the making or manufacturing all such articles of sheet, brass, zinc or other metal, capable of being rolled into sheets and pressed or formed to the required shape and size, whether they are to be employed in flyer cap-cup or other kind of spinning and twisting machinery.

—Patent abandoned.

3358 R. NEEDHAM, Dukindeld. Scrapers. Dated November 5, 1868.

3393 M. NEDHAM, DIKINHIELD Scrapers. Dated November 5, 1868.

This consists in so arranging the scrapers of fuel economizers that, notwithstanding the constant wear to which they are subjected, their edges will constantly be kept in contact with the tubes or pipes, so as effectually to clear off all adhering soot. The scrapers are carried by frames or carriers, to which the necessary motion is imparted by any suitable arrangement of mechanism. These scrapers may be of certain already known forms, that is to say, they may be in the form of plates, out of one side of which a semicircular piece is cut corresponding to the diameter of the pipe, so that two of these placed face to face will just fit round one of the pipes. Or they may be in the form of long plates, out of one side of which a number of semicircular pieces are cut corresponding in size and position to the pipes, so that two of these blades placed face to face will just fit round one row of pipes.—Patent completed. completed.

completed.

3359 B. Hunt, Lincoln's Inn. Electro-physiological battery. (A cosmunication). Dated November 5, 1868.

This consists in forming a battery for action on the human frame by arranging pairs of plates of dissimilar metals upon any desirable flexible and non-conducting base, and insulating cach pair of plates from the next pair, and insulating all from the base by any good insulating material, like rubber cloth. These plates may be of any convenient shape or size.—Patent completed.

3360 J. CLARK, Kendal. Shaping wood. Dated Novem-

3360 J. Clark, Kendal. Shaping wood. Dated November 5, 1868.
A hollow spindle is mounted on a headstock with bearings, in which it is capable of sliding and rotating, or the headstock may slide instead of the spindle. This spindle carries at one end two or more cutters (and may also carry a boring bit). A sliding collar having inclined slot holes, is applied outside the hollow spindle, which acts upon one or more of the cutters, so as to move the cutting edges nearer to or further from the axial line of the said spindles. The spindles and collars or the headstock are caused to slide by means of cam grooves suitably formed and arranged to operate thereon at proper times. Nipping jaws are also employed, which are opened to receive the wood to be operated upon by levers actuated by a cam or eccentric, and closed by weight or spring to hold the wood, the jaws being suitably formed to bite and hold theroon.—Patent completed.



3361 A. REID, Arbroath, N.B. Rolling tobacco. Dated tovember 5, 1868.

3361 A. Rein, Arbroath, N.B. Rolling tobacco. Dated November 5, 1868.

This consists in two face plates opposite to each other, and between which the roll is formed. Below or at one side of the face plates a guide for laying on the twist travels backwards and forwards. This is actuated by a ravers backwards and forwards. This is actuated by a lever or rod connecting it to the reciprocating slide below, motion being duly communicated thereto. Above the face plates a retarder is placed for regulating the required drag upon the twist as it is rolled up between the face plates.—Patent completed.

3362 J. CORBETT, Clerkenwell. Railway carriages. Dated November 5, 1868.

November 5, 1868.

The continuous or consecutive buffers are arranged so as to have a traverse both ways, that is, in and out of the carriages, and to meet in the middle when the springs are set up, and thus form one rod right through the carriages, and if driven in with force sufficient to set up the springs, the buffer ends strike the buffers in the next carriage, and so on from carriage to carriage, and thus relieve any single carriage from the violence of the shock in the event of a collision. The buffer rods going right through the train from carriage to carriage, the foremost carriage or the engine (if it be at the front) is the first that is struck after the springs of the buffers are set up till the rods meet.—Patent completed.

3363 A. L. BRICKNELL Stratford-on-Avon. Rotary engine. Dated November 5, 1868.

This relates to a patent, dated June 7, 1867 (No. 1871). In constructing rotary engines, in place of making the cylindrical centre-piece of the engine in pieces, which are botted or otherwise joined together, as heretofore, the inventor casts it in one piece upon its shaft in the manner hereinafter more fully described, and he afterwards turns it truly and slots out the recesses for the pistons, or he forms the recesses by casting the metal around boxes of sheet steel or iron, or he introduces metal cores or chills into the casting to produce the recesses, and he draws them out as soon as the casting is set. In some cases he uses, in place of the metal cores, sand cores, moulded in an iron box, made for the purpose with great accuracy and truth. In order to give more strength to the cylindrical centre-piece, the inventor hoops it with wrought iron around the flanges, which he prepares to receive the hoops by turning them slightly hollow. For engines of small size, he uses for casting the centre-piece a white metal alloy in place of casting. The helloy fluid most advantageous consists of nine parts of zinc and one part of tin, or thereabouts.—Patent completed.

3364 J. EDWARDS, Hackney. Harnen. Dated November 5, 1868.

This consists in making roller bolts hollow with a slot

3364 J. EDWARDS, Hackney. Harness. Dated November 5, 1868.

This consists in making roller bolts hollow, with a slot or slots in one side, so that the traces can be dropped in from above. The traces are made thicker at the ends to prevent them being drawn through the slots, a cap is formed to go on the top of the roller bolts, and cover up the opening: also in making back bands jointed in the middle, so as to be able to make the tug and back band in one piece; also in making back bands jointed in the middle, so as to be able to make the tug and back band in one piece; also in making hames with a screw at one ond to connect a chain to the ends, instead of the present leather strap; also in the application of rollers or projections inside the tugs to prevent rubbing the saddles; also in making screw cock eyes for shortening traces; also in making strew cock eyes for shortening traces; also in making the bearers of double harness to terminate in a spring to prevent the traces lifting up the bearers when the horse is drawing.—Patent abandoned.

3365 W. R. Lakig, Chancery-lane. Pegging boots. (A communication). Dated November 5, 1863.

This consists in the details of construction and arrangement of mechanism for cutting the wire for intermittenity feeding it to the action of vertical line with the nail driver and nail tube for feeding the shoe after each nail is driven, in such manner as to ensure the insertion of each nail into the hole punctured for its reception by the awl, and for holding the edge of the shoe under the feed foot at all times or at all points along each edge at a uniform angle with relation to the surface of the feed foot and the vertical line of the driver.—Patent abandoned.

3366 A. H. Robinson, Dublin, Cocts. Dated November 6, 1868.

3366 A. H. ROBINSON, Dublin. Cocts. Dated Novemers, 1868.
The body of the improved to be a second to the control of the contro

ber 6, 1868.

The body of the improved tap is provided with three branches, one leading direct from the main and provided with a spherical or other valve composed of cork, vulcanized india-rubber, metal, or other suitable material for opening and closing the communication, another leading to the rising main for supplying the house elstern, and the third affording the requisite supply for ordinary domestic purposes, as may be required. The valve is opened by a rod or spindle which passes through an opening in the front of the tap, and is connected to an internal screwed cap which screws on to an external screwed boss forming part of the body of the said cap, being provided with the usual crutch for turning the same.—Patent abandoned.

usual crutch for turning the same.—Patent abandoned. 3367 C. ARCHER, Holloway-road. Cigars. Dated November 6, 1868.

The inventor forms upon the circumference of the cigars, by means of pressure, longitudinal grooves or channels, varying in number, shape, and size, according to requirements.—Patent abandoned.

continues, waying in unitaries, and size, according to requirements.—Patent abandoned.

3368 J. H. Johnson, Lincoln's Inn. Pigments. (A communication). Dated November 6, 1868.

This consists in the purilication or removal of solid foreign matters from the carbonate of lime, in order to use it for pigments. This is effected by sifting the carbonate, whilst in a perfectly anhydrous state, in apparatus specially adapted for the purpose. One form of apparatus which will be found to answer well in practice, consists of two concentric polygonal screens placed at a slight inclination, and attached to a central longitudinal shaft to which rotatory motion is imparted by a strap and pulley, or otherwise, the screens being enclosed in a tight casing of wood or metal. The inner screen which projects beyond the outer one at the delivery end, is composed of wire gauze, and the outer one of fine textile fabric, and along the arms which carry these screens are sliding weights, which, as the arms revolve, alternately fall from and towards the centre, thereby giving a succession of shocks or blows to the screens, which have the effect of shaking off any fine particles which may be adhering thereto.—Patent abandoned.

3370 J. Samuel, Great George-street. Railway steam

thereto.—Patent abandoned.

2 3370 J. Samuel, Great George-street. Railway steam carriags. Dated November 6, 1868.

The boiler or boilers is or are firmly secured to the top table or platform of a "bogie" or "bogies" carrying the engine or engines at or mear to the centre, between the wheels of such "bogies" in a somewhat similar manner

to that described in the specification of letters patent granted to R. F. Fairlie, dated November 14, 1867, No. 3221. The locomotive or locomotives is or are made to support the ends of one, two, or more girder or "carrier frames," consisting of main girders framed together of any desired length at or near the centres of the "bogies," either above or below the plattorm, by means of a cross girder firmly fixed to the head of a centre pin, which fits into a hole or socket made in or near the centre of the engine frame or "bogie," and round which pin the engine is free to swivel or partially revolve. The girders may be continued parallel with each other to their junction, with the crosspiece or transverse girder fixed to the pin kead, or they may be narrowed towards their ends, so as to converge towards one centre and be firmly fixed to the entire pin head, or be formed into a boss to bear on the swivelling centre of the engine frame with a suitable hole in it, and through which a centre pin passes, thus permiting the swivelling motion of the engine.—Patent completed.

3371. I TAYLOR JUN Wiene Relies. Dated Novemers. pleted. 8371 J. TAYLOB, JUN., Wigan. Botlers. Dated Novem-

pleted.

3371 J. TAYLOB, JUN., Wigan. Bollers. Dated November 6, 1868.

This consists in doing away with the rollers for carrying the travelling bars, and instead thereof making use of either the ends of the bolts or joint pins, and also of the nuts on the other ends thereof, or the under sides of the bars themselves, and longitudinal slides or grooves attached to the sides of the firebox, as the means of supporting the bars on their passage through the firebox thereby allowing sufficient space for the passage of air up to and between the said bars. In Cornish and other similar boilers, the inventor carries the bars (after they have passed through the firebox from the front to the back thereof) down through the bottom of the firebox into and through a space below the boilers in order to get the bars back to re-enter the firebox. The invention also relates to improvements in the construction of the furnace doors of steam boilers, and consists in making the furnace doors hollow so that they may contain water whereby the fire is prevented from producing injurious effects upon the said furnace doors. The invention further relates to improvements in the construction of the fire bridges of steam boilers, and consists in making each of the said fire bridges hollow, to be so connected to its boiler as that the water in the boiler may freely pass through the said fire bridge, whereby instead of the fire bridge becoming burnt and injured by the fire, it becomes itself a useful generator of steam.—Patent completed.

3372 J. Parkort and W. Jones, Salford. Beetling fabrics. Dated November 6, 1868.

and injured by the fire, it becomes itself a useful generator of steam.—Patent completed.

3372 J. Parrott and W. Jones, Salford. Beetling fabrics. Dated November 6, 1868.

This consists, first, in dispensing with the vertical timbers or tailers and substituting in lieu thereof a succession of metal or other hummers attached by an elastic web or other suitable connection to a shaft or roller revolving at such a velocity as to throw out by centrifugal force the hammers which are brought in contact with the cloth or other material to be operated upon, the said cloth or other material having been previously wound on rollers provided for that purpose, or laid upon a horizontal table or other stationary surface. In making a beetling machine that will act continuously on the fabric, which is brought from any convenient number of batch rollers, and passed over a roller placed under the usual fallers, ounder the hammers acting by centrifugal force as above described, when the folds of fabric have passed over this roller they are wound continuously on a batch roller, or they are taken over guide rollers and brought a second time under the fallers or hammers, or they are otherwise disposed of.—Patent completed.

3378 F. C. Philippeson, Berlin. Pumps and fire engines.

this roller they are wound continuously on a batch roller, or they are taken over guide rollers and brought a second time under the fallers or hammers, or they are otherwise disposed of -Patent completed.

3373 F. C. Philippeson, Berlin. Pumps and fre enginet. Dated November 6, 1868.

3378 F. C. Philippeson, Berlin. Pumps and fre enginet. Dated November 6, 1868.

3378 F. C. Philippeson, Berlin. Pumps and fre enginet. Dated November 6, 1868.

3374 F. E. Martingal, the two sets of valves may be placed side by side.—Patent abandoned.

3374 F. E. Martingal, the two sets of valves may be placed side by side.—Patent abandoned.

3374 F. E. Martingal, the two sets of valves may be placed side by side.—Patent abandoned.

3374 F. E. Martingal, the inventor bonds the ends of the roll or wire, of which the heap is made at right angles to the body of the haap, and thereby forms projecting ends or pins. To these ends of the hasp he joints or connects as plate in the following manner:—On the one end of the middle of the corn of the plate, and bending the said cars upon the plate into a tubular form, the heap is connected with the plate, the said hasp and plate being jointed to extend the plate, and bending the said cars upon the plate into a tubular form, the heap is connected with the plate, the said hasp and plate being jointed to the plate, and bending the said cars upon the plate into a duble check in a triple of the earth of the cars of the plate, and bending the said cars upon the plate into a duble check in a triple of the cars of the plate, and bending the said cars where the plate of the plate of

of the endless travelling firebar class, and instead of employing endless chains carrying transverse lirebars, as hitherto frequently used, he has a series of endless jointed firebars, constructed as hereinafter described, and placed side by side, so as to form an endless chain running longitudinally through the furnace, and passing round octagonal or other suitably formed rollers, one placed in front of the firedoor, and driven by a worm and wheel, or other suitable slow movement, and the other forming a carrier only, and being placed inside the flue in front of the bridge. The endless jointed firebars are placed over the two rollers, side by side, having air spaces between them, and are jointed together by transverse rods, into which stud wheels or stud so reteth fixed to the octagonal or other rollers gear, so as to ensure the steady and regular movement of the whole series.—Patent completed.

3377 M. A. F. MENNONS, Newgate-street. Forming screen breads. (A communication). Dated November 6, 1868. This consists in the application of a waging process, by neans of improved apparatus to the formation of screen breads on wrought-iron bolts.—Patent completed.

3378 W. JENNER, Clerkenwell. Corn flour jelly. Dated

3378 W. JENNER, Clerkenwell. Corn flour jety. Dated November 6, 1868.

The corn flour jety is made in the following proportions, viz.:—60z. isinglass, 20z. gelatine, jtb. glycerine, jtb. corn flour, i j galton diluted water.—Patent completed.

3379 W. BROUGHTON, Finsbury Market. Kitchen ranges Dated November 6, 1863.

The inventor forms each of the lugs or flanges with a slot, through which the stem of the screw may pass freely, and be then screwed into a nut, which is unable to turn by reason of one of its sides resting against the side of the plate or part upon which the lugs or flanges are cast.—Patent completed. Patent completed.

Patent completed.

3380 A. M. CLARK, Chancery-lane, E.C. Rojes, tack
dc. (A communication.) Dated November 6, 1-68.
In making a cable of any suitable dimensions, the inventor takes a number of yarns, strings, or twines, and stretchesthem equally, afterwards laying them together in bundles, without twisting. This may be done either by hand or machine. On this cylindrical bundle of yarns the inventor weaves a sheath or envelope, composed either of rope, yarn, string, or twine, or it may be of metal wire. In this manner he produces ropes, cables, and cordage of any required diameter, presenting externally the appearance of blind cord. The yarns, strings, or twines are previously passed through a solution of gutta-percha, in order to impart sufficient suppleness to enable the ropes so made to pass round pulleys of small diameter.—Patent completed.

3341 J. C. Haddan, Vincent-square, Westminster. Cannon

completed.

334 J.C. Haddan, Vincent-square, Westminster. Cannon reads and carriages. Dated November 7, 1868.

This consists in constructing such wads of a somewhat yielding material, which will upset or squeeze into the rifling, and so close the windage, and enclosing or embedding in or combining with the material, discs or pieces of metal, or of some hard material, which by the upsetting may be driven into the rifling of the cannon, and into recesses in the projectile, and so become keys compelling the projectile to acquire the twist as they with it and the remainder of the wad are driven forward in the bore of the gun.—Patent completed.

3382 S. ARNOTT, Holloway. Braces. Dated November 7, 1868

1868.
The inventor employs straps, bands, or webs, which are crossed or connected to each other at the back; the front ends are provided with button holes as usual, and are buttoned to the trowsers, at of near the side seam, but instead of the ends which are usually buttoned to the back



1433 C. Cross and A. Heywood, jun., Manchester, and G. D. and T. B. Wilson, Cressbrook, Derbyshire. Improvements in velocipedes.
1439 T. Dunn, Pendleton. Improvements in the construction of velocipedes.
1440 W. R. Lake, Southampton-buildings, Chancerylane. An improved detergent or saponaceous compound.
1441 C. D. Abel, Southampton-buildings, Chancery-lane. Improvements in galvanic batteries.
1442 B. Latham, Westminster Chambers, Westminster. Improvements in ventilators for sewers, also applicable for deedorzing norsious gases arising in the processes of

for deodorizing noxious gases arising in the processes of certain manufactures.

certain manufactures.

1443 B. J. B. Mills, Southampton-buildings, Middlesex. Improvements in casting metals under pressure, and in apparatus and appliances therefor.

1444 J. A. Marden, Boston, Massachusetts, U.S.A. Having reference to steam and other enginery.

1445 J. B. Payne, Chard, Somersetshire. Improvements in the fittings for roller blinds, parts of which improvements are also applicable for suspending picture frames, and for coupling, joining, or connecting together the ends of ropes, cords, or bands.

1446 L. Wray, Ramsgate, Kent. Improved apparatus for crushing, grinding, and pulverizing quartz and other

1446 L. Wray, Ramsgate, Kent. Improved apparatus for crushing, grinding, and pulverizing quartz and other hard substances.

1447 A. Vickers, Old Broad-street, City. Improvements in connecting and sustaining the rails of railways.

1448 A. Henry, Edinburgh. Improvements in breechloading firearms.

loading firearms.

Dated May 12, 1869.

1449 C. H. Merritt, Brunswick-square, Middlesex. Improvements in apparatus for basting.

1450 J. Robey, Victoria Sugar Refinery, Newcastle-auder-Lyme. Improvements in sugar refining.

1451 E. T. Hughes, Chancery-lane. Improvements in tea and coffee urns.

1452 P. W. Flower, Briton Ferry, Neath, Glamorganshire, and W. Flower, Great Winchester-street-buildings, City. Improvements in the method and process of producing impressions upon tin and terne plates and sheets of metal, and in furnaces or ovens for heating and drying of metal, and in furnaces or ovens for heating and plates or sheets which have received the required impres-

sions.

1453 H. Ing. St. John-street-road, E.C. Improvements in fastenings and clasps for albums, books, and other like

1454 J. B. Handyside, Glasgow. Improvements in

wheels.
1455 T. Bullivant, Ledbury-read, Bayswater, Middlesex.
Improvements in window sashes, shutters, and frames,
and in pulleys for the same and for other purposes.
1456 H. Robinson, Skipton, Yorkshire. Improvements
in the construction of kilns for burning limestone, chalk,

cement, or for calcining ores.

1457 J. L. Greatorex, East Grinstead, Sussex. Improve-

1457 J. L. Greatorex, East Grinstead, Sussex. Improvements in urinals.

1458 P. W. Flower, Melyn Tin Plate Works, Neath, Glamorganshire, H. Nash, India-buildings, Water-street, Liverpool, and R. Heathfield, Birmingham. Improvements in coating sheets of metal with other metals.

1459 J. H. Johnson, Lincoln's Inn-fields. Improvements in saw teeth, and in machinery or apparatus for forming the same.

1460 F. R. A. Glover, Brading Isle of Wight. Improve-

188W teeth, and in machinery or apparatus 18 same. 1460 F. R. A. Glover, Brading, Isle of Wight

1460 F. R. A. Glover, Brading, Isle of Wight. Improvements in anchors, and in the gear for facilitating the weighing and boarding of anchors.

1461 A. V. Newton, Chancery-lane. Improved machinery for expressing juices from organic matters.

1462 W. F. de la Rue, Bunhill-row, City. An improved method of obtaining a water mark on paper, and in apparatus authors of the sain.

ratus employed therein.

ratus employed therein.

Dated May 13, 1869.

1463 V. de Stains, Shepperton Villas, N. Improvements in wheels, treadles, and brakes, principally applicable to bicycles and other light carriages.

1464 E. V. Newton, Oxford-street, and P. M. Crane, Manchester. A new or improved composition for coating ships, boats, and other surfaces, and for protecting and preventing the fouling thereof.

1465 J. Timmins and J. Gayton, Birmingham. A new or improved lever fastening, for securely holding in a state of tension cords, cables, wire ropes, chains, or the like.

state of tension cords, cables, who reports in window like.

1466 H. Luke, Manchester. Improvements in window sashes, and in fastenings for the same.

1467 W. A. Lyttle, Grove, Hammersmith. Improvements in electro-telegraphic apparatus.

1468 T. G. F. Dolby, Forest Gate, Essex. An improved apparatus or valve suitable for the admission of air to feeding bottles and for other useful purposes.

1469 J. Townsend and P. Forbes, Glasgow. Improvements in refining or treating oils and fats, and in apparatus therefor.

1470 I. and G. Battinson and T. Whitehead, Halifax. Improvements in machinery for combing wool and other

fibres.

1471 J. Fawcett, Huddersfield. Improved means or apparatus for measuring oil or other liquids.

1472 C. Ferguson, Glasgow. Improvements in the washing, brushing, filling, and corking of bottles, and in the means, apparatus, or mechanism employed therefor, part of which mechanism is also applicable for other purcease.

poses.

1473 J. Bownes, Mansfield, Nottinghamshire. Improvements in machinery or apparatus for steaming and compressing tobacco.

1474 A. Friedmann, Hatton-garden, Middlesex. An improved ornament for personal wear.

1475 W. Cadogan, St. Anne-street, Birkenhead, Cheshire. Improvements in couplings for connecting together the ends of driving straps or bands.

1476 W. Stephenson, Sculcoats, Yorkshire. Improvements in apparatus for facilitating the consumption of smoke in furnaces.

Dated May 14, 1869.

1477 I. and J. H. Storey, Manchester, and H. Lea and T. Lane, Birmingham. Improvements in means for controlling the discharge of water from stand pipes, drinking

trolling the discharge of water from stand pipes, drinking fountsins, and ball taps or valves.

1478 J. and J. Kippax, Bolton-le-Moors. Improvements in the means of weaving counterpanes or quilts.

1479 C. W. Lancaster, New Bond-street, Middlesex. Improved apparatus for concentrating shot.

1480 J. T. Griffin, Fleet-street, City. Improvements in the manufacture of knives and forks, and in handles for he same.

the manufacture of knives and lower, he same.

1481 W. Finley, Stockport, Cheshire. Improvements in

working and applying the brakes of railway carriages, and in apparatus connected therewith.

1482 H. B. Barlow, Manchester. Improvements in cases for bottles and glass or other cups.

1483 G. F. Henry, I. A. F. Bang, F. R. C. Monestier, and J. P. A. Figuier, Paris. An improvement in liquids for the lubrication of sheep's or other wool or other animal textile fibrous materials.

1484 M. Wolfsky, Pilgrim-street, Ludgate-hill, City. An improved sliding fastening or lock for purses, pocket-books, boxes, satchels, bags, and other similar articles.

1485 F. Hedley, Richmond, Yorkshire. Improvements in horse shoes.

in horse

1486 J. H. Johnson, Lincoln's Inn-fields. Improvements in horse shoes.

1486 J. H. Johnson, Lincoln's Inn-fields. Improvements in the treatment of beetroot and other pulps, and in the machinery or apparatus employed therein.

1487 C. E. Spooner, Bron.y-Garth, Port Madoe, Carnarvonshire, and G. A. Huddarf, Brynkir, Carnarvonshire, and G. A. Huddarf, Brynkir, Carnarvonshire. Improvements in the construction of railways.

1488 G. T. Bousfield, Loughborough Park, Brixton, Surrey. Improvements in apparatus for lifting building blocks of stone, concrete, or other material, and for disengaging such blocks from the lifting apparatus.

1489 C. H. Gardner, West Harding-street, Fetter-lane, City, and J. Bickerton, Oldham. Improvements in lithographic and zincographic cylinder printing machines.

Dated May 15, 1869. 1490 I. M. Hilbank, Greenfield Hill, Connecticut, U.S.A. in improvement in cartridges for breech-loading fire-

1491 V. R. Batchelor, Marylebone, Middlesex. Improved arrangements for giving motion to wheels, specially applicable for the propulsion of hand power carriages.

1492 S. Corbett, Wellington, Salop. Improvements in

cable for the propulsion of hand power carriages. 1492 S. Corbett, Wellington, Salop. Improvements in velocipedes.

1493 L. A. V. Dubourg, Leicester-street, Leicester-square, Middlesex. Improvements in the manufacture of gas for lighting and heating purposes, and in the apparatus employed therein.

1494 F. E. Saxby, Great Howard-street, Liverpool, and L. M. McGeorge, Upper Pitt-street, Liverpool. The purpose of conveying persons or things upon the common highway (or any other way or road whatsoever), which shall be named and known as the Planetery velocipedo.

1495 W. Wilkinson, Seymour-street, Euston-square, Middlesex, and M. Boss, Cleveland-street, Fitzroy-square, Middlesex. Improvements in embossing, printing, enamelling, and ornamenting glass, fmetal, wood, canvas, or other woven prepared fabrics or other substances, and the preparation of the material or materials and ingredients employed therein, and machinery or apparatus appertaining to a part thereof.

1496 J. S. Jarvis, Wood-street, City. A seamless collar and tie combined.

and tie combined.

1497 T. Berney, Bracon Hall, Norfolk. Improvements in the mounting and working of defensive armour for the protection of ordnance in battery and in ships' fortifications and elsewhere, and in apparatus connected there-

with.

Dated May 17, 1869.

1498 F. Kohn, Robert-street, Adelphi, Westminster.
Improvements in the mode of extracting the juice from
sugar cane, beetroot, and other plants.

1499 R. Bodmer, Osborne House, Holland Park, Middlesex, J. J. Bodmer, Newport, Monmouthshire, and L. R.
Bodmer, Lansdowne-road, Notting Hill, Middlesex. Improvements in firegrates, applicable to steam boiler furnaces and other furnaces.

1500 R. Wilson, Patricroft, near Manchester. Improvements in machinery for preparing to be spun, and for

ments in machinery for preparing to be spun, and for spinning and doubling, cotton and other fibrous materials. 1501 H. de Garrs, Summerfield-street, Ecclesall-road, spinning and doubling, containing the spinning and doubling, containing the spinning and coupling the spinning that the

low, Sheffield. Improvements in the manufacture of spring knife cutlery.

1503 R. Harlow, Heaton Norris, Lancashire. Improvements in hot water boilers used for heating purposes.

1504 D. Hitchen, Halifax. Improvements in looms for

weaving. 1505 A. Dunn and A. Liddell, White-street, Southwark. 1505 A. Dunn and A. Liddell, White-street, Southwark. Improvements in the construction of metal cans or tins. 1506 C. E. Brooman, Fleet-street, City, patent agent. Improvements in apparatus for applying brakes on railways. (A communication).

1507 T. Wright and I. Fox, Nottinghamshire. Improvements in the manufacture of lace made on bobbin-not or twist-lace machines, and in the machinery or apparatus employed therein.

1508 S. W. Clark, Tower Royal, City, and W. R. Sykes, Clapham, Surrey. Improvements in hand signal and other railway lamps.

1509 W. E. Newton, Chancery-lane. Improvements in factory sliver cans.

ctory sliver cans.
1510 W. R. Lake, Southampton-buildings, Chancery-

lane. 1511

1510 W. K. Lake, Soutasmpton-outlangs, Chancery-lane. Improvements in revolving firearms.

1511 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in apparatus for drying sugar.

1512 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in machinery for forming the threads of metal screws.

#### LIST OF SEALED PATENTS. Sealed May 14, 1869.

Sealed Ma
3493 J. E. H. Harris and
T. Lumley
3499 C. Richardson
3506 A. McDougall
3507 A. W. Drayson
3510 W. T. Bassett
3518 S. Crighton and J.
Tatt
3514 W. Thompson
3519 D. Jones and J.
Jackson 14, 1869.
3521 J. Green
3523 J. McGlashan
3524 J. D. Hopkins
3544 J. D. Hopkins
3545 F. W. Webb
3553 C. Crabtree
3554 Band B. T. Newnham
3593 N. D. Spartali
3761 W. S. Jackson
420 A. B. Rickon 439 A. B. Binko 919 H. A. Bonneville D. Jones Jackson

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1351 W. Austin 1358 B. Nicoll 1361 T. Hunt 1365 A. P. Price 1379 G. Haseltins

1402 J. Bealc 1435 P. J. Messent 1442 J. J. Marcais 1501 W. R. Pape

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1424 H. Cartwright 1466 J. P. Jouvin 1467 J. Dicker 1450 C. T. Porter

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Gazette," May 18, 1869 ette," May 18, 1869
110 J. R. Hodgson
112 E. P. North
169 G. Lowry
230 A. V. Newton
280 G. Tangye
264 R. M. Marchant
359 W. Adams and
G. Beattie
431 C. Thomas
502 J. Newton
633 W. Olley
873 J. E. Emerson
875 A. Clark 959 G. T. Bousfield 18 H. A. Bonneville 21 J. M'Kenny 24 L. Hannart 24 L. Hannari
40 J. S. Gisborne
42 K. Walter
43 A. Tyler
59 J. Daglish
61 A. B. Brown
62 W. T. Walte
63 T. B. Sydserff
65 M. Wilkin and J.
Clark and W. 873 J. E. Emerson 875 A. Clark 1081 B. J. Morison 1165 A. W. C. Williams 1240 J. C. Ridley 1257 T. Wilson 1278 T. Forster and P. B. Cow 1379 J. Tall and A. Wil-liams Clark
70 M. Saunders and H. 70 M. Saunders and H.
Forrest
80 J. Petrie
86 C. M. Dougall and C.
H. Eden
91 Sir F. Sykes
98 C. J. Gunther
101 L. Sterne, J. A.
Jaques, and J. A.
Fanshawe No re 1444 J. A. Marden

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.
Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners office, particulars in writing of the objection to the application. leaving at the Commissioners one of the objection to the application.

PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the fol-

871   1270   1336   1346   1357   1367   1377   1386   902   1283   1338   1347   1358   1368   1378   1387   903   1325   1339   1348   1359   1369   1379   1398   1099   1327   1340   1349   1360   1370   1340   1390									_
1015         1328         1341         1351         1361         1372         1381         1392           1143         1329         1342         1353         1362         1373         1382         1394           1193         1330         1343         1354         1363         1374         1383         1398           1221         1334         1344         1355         1364         1375         1384         1398           1260         1335         1345         1366         1366         1376         1385         1400	902 903 1009 1015 1143 1193 1221	1283 1325 1327 1328 1329 1330 1334	1838 1339 1340 1341 1342 1343 1344	1347 1348 1349 1351 1353 1354 1355	1358 1359 1360 1361 1362 1363 1364	1368 1369 1370 1372 1373 1374 1375	1878 1379 1380 1381 1382 1383 1384	1387 1388 1390 1392 1394 1396 1398	

#### OF SPECIFICATIONS PUBLISHED LIST

For the week ending May 15, 1869.

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3013	0 4	3051	0 4	3069	0 4	3083	0 4	3100	0 10	3115	0 4
3035	0 4	3052	2 6	3070	0 4	3084	0 10	3103	0 4	3116	0 4
3037	0 4	3053	0 4	3071	0 4	3085	0 4	3104	0 4	3117	1 0
3038	0 4	3054	1 16	3072	0 10	3086	0 4	3105	0 8	3118	0 4
3039	2 4	3155	0 4	3074	0 6	3087	0 4	3106	0 8	3119	0 4
3040	0 10	3056	0 8	3075	0 4	3088	0 4	3107	0 8	3120	0 8
3041	0 10	3057	0 4	3076	0 10	3091	0 4	3108	0 4	3138	0 6
3042	0 4	3058	0 10	3077	0 4	3092	0 6	3109	0 4	3141	0 4
3043	0 6	3059	0 4	3078	0 4	3094	1 10	3110	1 0	3167	0 4
3045	0 4	3061	1 6	3079	0 8	3095	0 4	3111	0 4	3181	0 8
3047	0 10			3080		3096		3112	0 8	3190	
3048		3065		3081		3098				3336	
3049		3067			Ĭ	,	1				• ••

NOTICE.—Having received communications from persons NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be sent, payable to ROBERTSON, BROOMAN, and Co., Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

Science and Art .- A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the the great power of skilled mechanical fabour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated given [41]. Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to and they cannot be too strongly recommended to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVI.]

# MECHANICS' MAGAZINE.

LONDON: FRIDAY, MAY 28, 1869.

CONVERSAZIONE AT THE INSTI-TUTION OF CIVIL ENGINEERS.

THE president of the Institution of Civil Engineers, Mr. Charles Hutton Gregory, held a conversazione at the house of the Institution in Great George-street, Westminster, on Tuesday evening last. It was exceedingly well attended by members of the engineering profession and leading men of science, about a thousand gentlemen, we believe, having honoured the president's invitation. Before passing to the interesting objects with which the hall was well stocked, we must first glance at the building itself, which has been greatly altered and improved since this time last year. The exterior of the house remains the same. but the acquirement of adjacent property has enabled a vast change for the better to be made in the interior. On the left of the entrance hall is the secretary's room, 24ft. long by 17ft. wide. Beyond this is the cieras of a room 17ft. long by 16ft. wide. On the operation occasion, these two rooms were thrown into one, and formed a spacious cloak room. Leaving the inner hall, which is well tesselated with coloured marble, we pass the foot of the main staircase, and, after going down five steps, we arrive in the lobby, leading, on the left, to the council room, towards the right to the members' reading and writing room, and further, on the extreme right, to the lavatories and water-closets. ing and writing room occupies an area of 40ft. by 28ft. 41in., and is supported upon four columns, two of which stand almost in the centre of the apartment, and the other close to a movable partition, which shuts off the council room from it. On Tuesday evening, these rooms were thrown into one, and made a splendid refreshment and crush room. Returning to the main staircase, we ascend it. and find ourselves in the library, which is now a handsome room 42ft. by 28ft. first and second floors of the old building have been thrown into one, and a gallery, supported on brackets, is carried around the room at the old upper floor level. This gallery is wide enough to contain bookcases and leave space enough for stools and desks for readers. The library is illuminated with two 28-burner sunlights, and sufficient ventilation is secured by gratings in the ceiling.
On the same level as the library is the

lecture hall, which has a clear area of 60ft. by 40ft., with a height of 30ft. from the floor to the springing of the dome, by which the room is lighted. There are four entrances to the theatre, the doorways of which are hand-somely executed in oak. The principal entrance opens from the landing at the head of the main stairs, a landing 6ft. wide, and extending from the meeting room to the library. A second access is obtained by a door on the extreme left, by a gallery parallel to the landing, which is approached from the library, and is intended on ordinary occasions for the entry of members who arrive after the proceedings of the evening have commenced. To the right, a staged gallery has been thrown over the back yard of the adjoining premises to the end of the meeting room, and two more doors open from this gallery The sides of the theatre are treated with Doric and Ionic pilasters, terminating in enriched cantilevers and cornices at the ceil-ing. The bays left between the pilasters are filled with pictures belonging to the Institu-tion. One of the most admirable features in the arrangement is in the provision made for the convenience of the host of visitors on

circulation is insured on the ground floor, in the refreshment room, and upstairs. The side entrance to the theatre from the library, as well as the main entrance at the head of the flight of stairs, afforded ample accommoda-tion for the streams of guests which were moving from one part of the building to another on Tuesday evening.

The lighting and ventilation of the theatre have been effected on the best principles. In the day time, the light is obtained from a central dome, 19ft. in diameter, and from eight lunettes. By night, the theatre is illuminated by three sunlights; the main or central one in the middle of the dome has 63 lights, and the two side ones 28 lights Two grated openings are provided in the ceiling for ventilation, and thirteen more of these openings, placed around the room about 15in. above the floor, admit the warmed air, forced from the basement, at the rate of 400,000 cubic feet per hour, being an allowance of 800 cubic feet per hour for 500 people. The supply of fresh air is taken from the outside of the building, and is carried along an underground channel, leading into the basement. At the extremity of this channel is fixed a fan, driven by a onehorse gas engine, by which the air is forced into an air chamber, where it is warmed in winter and cooled in summer. Thence it passes into a series of air channels, which convey it to the vertical air flues, constructed in the walls of the building, and by means of which it is uniformly distributed. The warmed air enters the theatre through the gratings, and beneath openings left for the purpose in the risers of the platform, beneath the rows of seats. For warming the air, there is a series of hot water pipes, 4in. in diameter, disposed in horizontal tiers, and so arranged that the entire volume of air used for ventilation must be passed amongst the spaces between them before it leaves the chamber. The axis of the fan used for forcchamber. ing the air into the building has its axis parallel with that of the air channels, and it carries two blades placed at 50deg., the diameter being 3ft. Means have also been provided for filtering the air before admitting it, and in summer a cold water spray is forced against a fine wire gauze screen covering the mouth of the channel, to cool the air on its The admission is regulated by passage. valves, which are placed in the different branches. The whole arrangements are exceedingly satisfactory, and if any be disposed to cavil at one or two peculiarities in architectural detail, which are to be found in the front portion, they must remember that the architect was cramped in his operations by the fixed and irregular boundaries of the abutting property. Mr. J. H. Wyatt is the architect, and he has been assisted by various members of the Institution. Mr. C. H. Gregory, the president, and Mr. James Forrest, the secretary, have been unceasing in their exertions during the time the improvements have been going on, and to them the members owe a debt of gratitude for their services in the matter.

Having given our readers some idea of the new arrangements at the house of the Institution, we will turn to the objects of interest which were exhibited last Tuesday On entering the hall, our attention was first arrested by a collection of small arms representative of those used, and to be used, in the British service. These were lent by General Lefroy; and conspicuous amongst them was the Martini-Henry rifle, which attracted considerable attention, every one who handled it quickly becoming familiar with its manipulation. There were also specimens of other arms with which our readers are already familiar. There was a clever portable cleaning apparatus for military breech-loaders, which was designed by Mr. C. E. H. Healey to obviate the wearing

one of which is fixed by a small strap on the stock of the rifle, just behind the lock, the other being mounted on a cap which fits over the muzzle of the piece. The brass jag, around which the tow is wrapped, is attached to two pieces of cord, one at each end. In use, one end of the cord is dropped through the barrel, brought out at the breech, passed under the pulley, and hooked to a wooden handle on the other end of the cord, which is brought over the pulley at the muzzle. handle being worked up and down, the tow inside effects the cleaning of the barrel with less labour and more rapidly than the steel rod, whilst the rifling is preserved from damage by the rod. Mr. E. H. Newby sent a Henry breech-loader out of which more than 30,000 rounds had been fired; the rifling showed no signs of deterioration whatever. Mr. Newby also exhibited sections of the Henry cartridge, showing its construction, and specimens of the Henry rifling. He also sent a pouch for breech-loading cartridges, which was designed by Major General Morris, of the U.S. army, and which was used in the Indian campaign. It has a swivelled and a fixedrack, which are conveniently arranged for use in quick loading. A simple apparatus for disengaging ships' boats was also exhibited by the same gentleman. This arrangement is applied to the splendid new passenger steamers of the North Ger-Lloyds, and is now being adopted by other steamship companies. Close by, was a model of Messrs. Green's well-known patent fuel economizer, with its scrapers and gearing, all which have recently been described in our pages. Messrs. Howard, of Bedford, sent a model of their safety boiler, which is built up of wrought-iron tubes, and which continues to increase in favour with steam users. Close handy, was an illustration of the newly revived system of locomotion by the velocipede, one of which, a bicycle, was sent by Messrs. Meredith, of Bankside.

Rock boring and coal cutting machinery was well represented by examples of these by Mr. Brunton, Messrs. Carrett and Marshall, Mr. Doering, Mr. Firth, &c. Mr. Doering had a model showing his most recent improvements in boring machinery, which will be found fully described and illustrated on another page of our present issue. The Maury Barometer Company sent specimens of this useful instrument, which is about the size of a chronometer, and may be similarly carried in the pocket. The Maury barometer contains a vacuum-box resembling that of the aneroid in appearance, but made of a material and by a process which give greater permanence to its elasticity in long ranges. The rise and fall of the box is measured by a fine micrometer screw, worked by the observer, and furnished with an index hand. The range may be extended through 24 barometric inches, if required, and the indications will still remain more accurate than those of an average aneroid through one quarter of the range. The main spring, which keeps the vacuum-box distended, is about four times longer than that of the best aneroids, and thus the spring is enabled to expand and contract through four times the range without more strain on each portion of its length. Messrs. W. A. Martin and Co. exhibited their balanced furnace doors, which possess a great command over furnaces for consuming smoke. The air is admitted only at the lowest point, and is brought to a focus in the mouth of the furnace, thus removing the "stive" or stagnant heat which is so destructive to boilers and furnaces. By the heat passing regularly round the flues or tubes, the boiler will expand equally and be preserved. These doors are mounted or axles, and swing inside the furnace to any angle required, accommodating themselves to the fuel, thus consuming smoke and intensifying the heat. They open outwards with the the convenience of the host of visitors on effect of the steel cleaning rods at present in slightest touch, and for charging or regulatconversazione nights. A thorough means of use. It consists of a couple of small pulleys, ing the fire are very simple in their action.

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Close by these furnace doors was one of Blake's stone breaking machines, with which Mr. Marsden, the exhibitor and manufacturer, was industriously reducing to fragments a stock of flint stones. In this machine there is an eccentric, every revolution of which caused the lower end of the movable jaw to advance towards the fixed jaw about a quarter of an inch, and return. A stone dropped in between the convergent faces of the jaws is thus broken by the next succeeding bite; the fragments then fall lower down, and are broken again, and so on, until they are small enough to pass out at the bottom. readiness with which the hardest stones yielded at once to the influence of this gentle and quiet movement, and melted down into small fragments, surprised every one who witnessed the operation of the machine.

In sewerage matters, we have, first, a model of a machine invented by Mr. Baldwin Latham, for extracting the solid matter from The model exhibited was an exact sewage. representation of one of these machines now being made for Croydon. It consists of a large wheel, carrying grids of different sizes, and turned round by a turbine, which is worked by the natural fall of the water. gratings are arranged in two planes, filling up, as it were, the spaces between the arms of the wheel; and there are brushes, which clear away such solid matter as may adhere to them. In addition to these two ranges of gratings, there are others, set radially in a plane parallel to the axis of the wheel, and these are in appearance exactly similar to the step of a common step ladder. At the outer extremities of these radial gratings there are cups which lift up a quantity of water, and upset when the steps are in such a position that the water runs down instead of passing through the gratings. This sudden rush of water washes off the solid matter into a central trough, from whence it is conveyed away by an ordinary elevator. The turbine, which was designed and manufactured by Mr. Arthur Rigg, jun., has also several novel features, being so arranged that it can be taken to pieces for cleaning with the greatest The wheel and buckets lift up facility. without undoing any fastening, and the guides are held in their places by a simple locking contrivance, the reactive pressure of the water preventing them coming undone. These guides are separated into four equal groups, two of which are supplied by one large sluice, and each of the other groups has its own sluice, so that the quantity of water can be regulated according to the supply and the work to be done. Mr. Arthur Jacob exhibited a model of his patent ventilating apparatus, which consists of a cover somewhat similar to that in general use, and in the centre of which there is a circular opening to receive a cylinder of sheet iron. This cylinder is provided with a collar that prevents it from passing quite through the cover, and so suspends it in the top of the manhole or ventilating shaft. The cylinder, which is stopped at the lower end by a grating, contains a quantity of charcoal. broken into pieces of the size of a walnut, and is open at the upper end. Over the top of the cylinder there is a movable cover of cast iron, which serves to protect the char-coal from wet and grit, and which admits of the air from the sewer escaping, after having passed through the cylinder of charcoal. This apparatus will be found fully described and illustrated in our issue for April 2 last

Mr. T. J. Ellis sent some illustrations of the ABC sewage process. These consisted of specimens of the supernatant water obtained from the experimental works at Tottenham, Leicester, and Leamington, and the permanent works just completed at the last-named place, for carrying out the A B C process, together with

The process, as now carried out at Leamington, is the invention of Messrs. Sillar and Wigner, of Cornhill. It is very simple, and, to all appearance, perfectly effective. The to all appearance, perfectly effective. The A B C mixture, which is composed of animal charcoal, blood, and clay, with some alum and water, is stirred into the sewage, and the whole allowed to run into settling tanks. Here, nearly all the organic matter, together with the ammonia and phosphates, are precipitated in the form of large flakes, leaving the water clear, and nearly inodorous. The last traces of smell are removed by a small quantity of a solution of perchloride of iron. thus runs off clear, tasteless, and inodorous, containing about seven grains of organic impurity to the gallon, and a few mineral salts of a perfectly harmless nature. During the process of drying the precipitate, a little acid is added, to render it fit for agricultural The product is, at present, being manure. sold for £3 10s. a ton, and the demand for it at Leamington is stated to be greater than the supply. Specimens of this manure were shown. It is a nearly black powder, with a smell resembling the finest hothouse leafmould. Mr. George Jennings, the sanitary engineer, exhibited illustrations of his appliances for the reception, treatment, and distribution of sewage or other waters. The tribution of sewage or other waters. sewage flowing from the sewer is received on a grating of proportionate size, through which the liquid sewage passes, first to a water-wheel, to which it gives motion, and then to the earthenware carriers direct for distribution, thus rendering all subsiding tanks unnecessary. The revolving of the water-wheel gives motion to an endless chain, which carries two sets of teeth, which are thus made continually to pass between the bars of the grating on which the sewage flows. These teeth, in their progress, comb from the surface of the grating all matters unfit for irrigation, and carry them forward, and down the shoot, to any receptacle prepared for them.

Steam pumps were represented, in the first place, by Messrs. Hayward, Tyler, and Co., who had a working model of their new pump, which successfully demonstrated its principle. As a full description of this pump appears on another page of this number of our journal, we need not here refer to it. Mr. W. Tijon exhibited his patent steam feed pump, of which we hope to have more to say shortly. Mr. De Rusett's patent steam pump is a very simple affair, no working parts being exposed. It makes its suction and forcing exposed. It makes its suction and forcing strokes at equal speeds; therefore, there can be no racing. The pump fills at any speed, from 1 to 150 strokes per minute, and that without knocking. This pump takes steam on the forcing stroke only, working against a regulated pressure, which is sufficient for the return or suction stroke. The depth of suction at which it is intended to draw is regulated by admitting more or less steam at regulated by admitting more or less steam at the suction side of the piston, so that, for high pressures and small suctions, its advantages are evident. Messrs. J. and H. Gwynne sent two models of the pumps for which they are celebrated. Messrs. Kittoe and Brother-hood exhibited a specimen of their Paragon pump, which, we understand, is coming into extensive use. Mr. J. C. R. Okes also sent two models of universal steam pumps. Finally, Messrs. Weston had a model of their Niagara pump and of their special steam pump.

Messrs. L. Sterne and Co. exhibited the result of a very interesting experiment in taking up the recoil of a gun. This was a pneumatic rubber buffer and a block of wood which had been used in one of Messrs. Vavasseur and Co.'s new gun carriages lately experimented upon at Portsmouth. The block of wood was inserted in the cylinder, along with the buffer spring, to take up the recoil of the gun. The wood was used as a sub-

At the first discharge, the gun went cldan home to the buffer, and the 5in. block of wood was compressed to  $2\frac{1}{4}$ in., but has since returned to  $3\frac{1}{4}$ in., whilst the spring has remained intact. The trial was made with a 6-ton gun, 22lb. charge of powder, and a 115lb. shot. The gun recoiled 4ft. 9in., and the rebound was 1ft. 9in. There was also a sample of rubber united to metal which had been torn apart, and which showed a beautiful fern-like fracture in the rubber caused by gradually increased pulling stress of 2,782lb. At this point, the rubber tore, but the junction of the rubber to the metal remained quite perfect and sound. Messrs. Sterne also sent several samples of their patent metallic rubber driving belts. They are composed of bands of steel covered and united with rubber. The steel gives the strength, and the rubber the adhesion. great advantage is that this belt is not affected by the changes of atmosphere, and therefore does not stretch and contract. One has been in use now for several months, and has never been altered or taken off the pulley since first put up, and more work is said to be got out of it than any other yet used in its place; neither is there any appearance of wear. It has also great superiority on the score of economy, for, when one side is worn out, the other can be used with equal results, and then, when both are worn out, the steel can again be united to new rubber.

Many objects of interest still remain to be described, but want of space obliges us, for the present, to bring our notice to a close, only to resume it in our next. We cannot, however, conclude without bearing testimony to the admirable arrangements which the executive of the Institution have devised for the convenience and comfort of the visitors. There was a splendid collection of paintings and other works of art, which, with the floral decorations, proved very attractive to those present.

#### A SPANISH INTERNATIONAL EXHI-BITION.

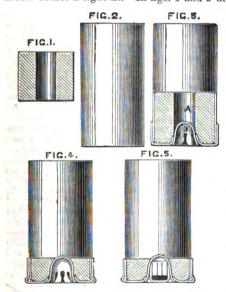
ONE of the best evidences that the internecine struggles which have of late troubled Spain are at an end, and one of the best guarantees that peace and prosperity are wished for and sought by the people, is fact that a proposition has been started for holding a Great National Exhibition at the Escurial. This speculation has received the encouragement of many influential persons in Madrid, who rightly judge that commercial and industrial prosperity ought to keep pace with political advancement. The Escurial with political advancement. has been selected for the exhibition, because it is convenient for such a purpose, and because Madrid does not offer the necessary facilities. Further, the Escurial—which is about 30 miles north-west of the city of Madrid, lying on the Northern Railway about an hour's journey down-is a far more pleasant place in the hot months than is the capital. Then, the building is already there, and most efficient for the purpose it would seem to be, for it is said to contain 16 courts, 1,111 windows outside, and 1,562 inside: 1,200 doors, 15 cloisters, 86 staircases, 3,000ft. of fresco painting, 89 fountains, and about 32 leagues of surface to walk upon. vast granite edifice, which was erected by Philip II., is built in the form of a gridiron, and forms a huge rectangular parallelogram, 744ft. from north to south, and 580ft. from east to west, and is divided up into long courts, which indicate the interstices of the bars. Towers at each angle of this parallelogram represent the feet of the gridiron, which is supposed to be lying upside down. From the centre of one of the sides a range of buildings abuts, representing the handle. This form was adopted in allusion to the instrument of St. Lorenzo's martyrdom-the building being dedicated to that saint. It some London sewage, showing the prestitute to fill up the case, as only one pneuwas intended to serve as a mausoleum and a cipitate at the bottom, and clear water above. matic spring was ready in time for the trials. was intended to serve as a mausoleum and a



was devoted, the handle being appropriated as a Royal residence. The chapel has three naves, 320ft. long and 320ft. high, to the top of the cupola. The pantheon, or royal tomb, is a magnificently decorated octagon chamber, 36ft. in diameter and 38ft. high. magnificent pile of granite, which has been called the eighth wonder of the world, is but a mere shadow of the past; its grandeur has departed, and now that such changes are being effected in the ecclesiastical administration of Spain, it has become a source of anxiety. Some of the leading scholars of the country have proposed to make the Escurial the general depository of all the archives now lying at Simancas, and in other places throughout the kingdom. The realization of such a project requires time and money, and, in the meanwhile, the silent hand of decay is at work on the uninhabited edifice, slowly rotting and undermining what it can never destroy. So nothing better, perhaps, at the present juncture, could have been devised than to utilize this building—itself one of the world's great shows—as an international exhibition. It will gather men of all nations together in the capital of Spain, which must be greatly to her gain in a commercial and an industrial sense. We look forward with interest to the further development of this scheme, to which we wish success. In no country has an exhibition of this character been held without the seeds of progress having been sown.

# MANUFACTURE OF CAPS AND CARTRIDGES. No. VII.

THE close of our last article brought us to the stage where the compound tubes of thin brass and paper, forming the case of the cartridge, were undergoing the operation of drying. They are subsequently cut to the proper size by a circular three-bladed revolving knife, care being taken that they are presented to it in the same direction so that the brass is wound inside the case. Sometimes, through carelessness or inadvertence, they are presented in the contrary direction, and, as a consequence, the metal is unrolled, and the paper torn to shreds. The next step is to unite the metallic end, which is furnished with its chamber and middle piece with the case. This operation is similar to that effected with cartridges for sporting purposes, except that no glue is used, as the expansion of the metal causes a tight fit. In figs. 1 and 2 are



represented a section of the middle piece, and an elevation of the cartridge case. In order to attach the case to the metallic end or bottom of the cartridge, it is placed upon a mandril, and one extremity of it brought into contact with a small die, which slightly turns up the edge of the case, and permits it to fit into the end. The case is again placed upon

the mandril, which being armed with a point, enters the hole left in the middle piece, and forces the chamber into it. This causes it to swell, and drives that portion of the case, between it and the metallic end, into such close contact that they are attached to one another in a manner which could not be surpassed by the use of the strongest glue. This completes the formation of the cartridge case, and it is then forwarded to the branch establishment of Moulineaux to be filled. fig. 3 is shown the case completely furnished with its middle piece A, chamber B, and small anvil for the purpose of percussion.

It is in this latter establishment that the

cartridges receive, so to speak, their finishing touches, and are ultimately rendered fit for the market. In addition to a large number of employés of both sexes, there are several very ingenious machines constructed for facilitating this portion of the manufacture. The principle of division of labour has been carried out in practice to the fullest extent. Each man, woman, and child, performs their allotted parts, which are adapted to their relative strength and intelligence. A number of boys seize upon the cartridges immediately on their arrival at Moulineaux, and commence to arrange them in large zinc boxes, holding about 200 each, in such a manner that all the openings are upwards. It is interesting to watch the different methods adopted by the boys to get their boxes filled in the quickest time. Some arrange them one by one in a most precise methodical manner, and, apparently, rather slowly; others fill both hands at once with the cases, and throw them into the boxes pell mell, afterwards shifting them so that the metallic end, which is heavier, should sink downwards. This, however, cannot be accomplished at once, but many successive shiftings and movings are neces sary before they are all settled in their places, so that there is not so much time gained as one might imagine, from the rapidity with which the several movements are effected. The boxes are then carried to the men who manipulate the machines. These latter never leave their respective machines, and their only duty is to attend to them, and supply them with the work they have to perform. The machines themselves were invented by the managing engineer, M. Calamel, and are termed "striking machines." They are They are mounted upon a cast-iron frame, and carry a couple of eccentrics, which act at the same time, but in opposite directions, upon the cartridge case, which is placed in a cylinder or matrix of suitable dimensions. The workwoman shifts the cartridges into a slide, at the end of which they are pushed on to a vertical table or large slab furnished with six matrices, which are rotated in such a manner as to bring them successively in the direction of the axis of the eccentrics. One of the eccentrics is furnished with a punch, in the inside of which there is a little hollow, in order that the shape of the chamber of the cartridge should not be altered by the pressure to which it is subjected. At the moment of stamping, a small distinguishing mark is imprinted upon the case of the cartridge, as a check upon the work performed by the machine. The other eccentric carries a disc machine. or plate having a small projection, corresponding to the ultimate form of the chamber. At every movement of the eccentrics, the punch and the plate approach each other, and compress the cartridge case in the interior of the cylindrical matrix placed in the line of their axis. This pressure, which is equal to many tons, causes the metallic end to swell out at the base, so as to fill up the spaces left in the matrix. A rim is formed at the base of the metallic portion, and this constitutes the work effected by the first "striking machine." In fig. 4 is represented a section of the cartridge at this stage, previous to its being submitted to the action of the

into a box, where they are again sorted and arranged by boys, who reject all which have received any deformation or damage by the operations they have undergone. struction of the second machine is very similar to that of the first, with the exception of a difference in the shape of the cylindrical matrix, which enables it to reduce the rim to a proper size and thickness. It also serves the purpose of fixing the brass lining to the metallic end, and thus prevents the escape of any gas through the weak parts of the base of the cartridge. In this condition, the cartridge is transferred to another part of the same workshop, to undergo the operation of priming. The priming charge, together with the anvil, is placed in a small hollow made in the centre of a movable disc. Upon this disc is also placed the cartridge, with its chamber exactly over the hollow containing the anvil and priming charge. By means of a lever, a small punch of the same diameter as the interior of the cartridge is caused to descend, and compresses the charge until a certain point is reached, upon which the cap rests. The diameters of the chamber and of the caps are accurately adjusted, so that the priming is strongly compressed in this opera-tion, and permanently fixed in its place. A section of the cartridge in this state is shown in fig. 5. It is now ready for the operation of gauging, which is effected by the aid of a slot or slide and two circular apertures. The slot is so constructed that any cartridge the thickness of whose rim exceeds the prescribed thickness, will not pass, and the two holes have unequal diameters. The one, the first to which the cartridge is presented, answers to the minimum, and the other to the maximum size allowed; should the cartridge fail to pass the second of these holes, it is rejected as too the second of these holes, it is rejected as too large, and if it passes through the first it is also rejected as too small. Those that are of the proper size, first pass the slot, then refuse to pass through the first hole, but traverse the second with facility. The diameter of the cartridges having been satisfactorily tested, the height is also ascertained with equal precision, and afterwards they are subjected to a close scrutiny upon other points. Any that have the priming compressed too much, or the wings of the chamber broken, or the anvil damaged, are summarily rejected. The cartridge cases may now be regarded as complete, and are despatched to that part of the premises where the operation of filling them is conducted. We must reserve an account of this for our next article.

# THE ROYAL INSTITUTION.

ON Thursday, May 13, also on Thursday, May 20, Dr. John Tyndall, F.R.S., continued his lectures upon "Light." In speaking of the "interference" of light, he said that it is necessary to clearly distinguish in the mind the difference between the motion of the wave itself and of the individual particles of ether composing the wave. The wave moves onwards, but the particles perform a very short excursion to and fro, much as a sea-fowl rises and falls on the billows of the ocean. When two series of waves of light from different sources come into contact with each other, a certain amount of disturbance or interference is the result. Supposing, that when waves of water come into contact, the crests of the one series of waves tend to occupy the same position as the crests of the other series of waves, union takes place, and another higher and more powerful series of waves is formed. If, on the other hand, when they first meet the crests of the one set of waves tend to occupy the depressions of other series of waves, the forces counteract each other, and stillness is the result. On the same principle, waves of sound may be obtained from two tuning forks, which here and there destroy achine. each other, and produce intervals of silence, known to musicians as "beats." Professor From the first machine, the cartridges pass Tyndall proved this by experiment. On the

same principle, it is possible, by adding light to light, to produce darkness.

The foregoing phenomena are intimately connected with those of the diffraction or the inflection of light. When a fine line of red light from a slit backed by red glass in front of the electric lamp is viewed from a distance through an opaque screen with a slit of variable aperture, an extraordinary appearance is observed. The slit in front of the lamp is seen as a vivid rectangle of light, but right and left of it is a long series of rectangles, decreasing in vividness, and separated from each other by intervals of absolute darkness. The lecturer explained that these intervals of darkness are caused by the interference of waves which destroy each other. He next explained how waves of light are measured, and closed by narrating the philosophy of the colours of thin plates. He said that when a beam of monochromatic light—say, of pure red, which is most easily obtained by absorption—fells upon a thin transparent film. tion—falls upon a thin, transparent film, a portion of the light is reflected at the first surface of the film; a portion enters the film, and is in part reflected at the second surface. This second portion having crossed the film to and fro is retarded with reference to the light first reflected. If the thickness of the film be such as to retard the beam reflected from the second surface, a whole wave-length, or any number of whole wave-lengths—or, in other words, any even number of half wave-lengths—the two reflected beams, travelling through the same ether, will be in complete accordance; they will, therefore, support each other, and make the film appear brighter than either of them would do taken singly. But if the thickness of the film be such as to retard the beam reflected from the second surface half a wave-length, or any odd number of half wave-lengths, the two reflected beams will be in complete discordance, and a destruction of light will follow. By the addition of light which has undergone more than one reflection at the second surface to the light which has undergone only one reflection, the beam reflected from the first surface may be totally destroyed. Where this total destruction of light occurs, the film appears black. If the film be of variable thickness, its various parts will appear bright or dark, according as the thickness favours the accordance or discordance of the reflected rays. Because of the different lengths of the waves of light, the different colours of the spectrum require different thicknesses to produce accordance and discordance; the longer the waves the greater must be the thickness of the film. Hence those thicknesses which effect the extinction of one colour will not effect the extinction of another. When, therefore, a film of variable thickness is illuminated by white light, it displays a variety of colours. These colours are called the colours of thin plates.

The colours of the soap bubble, of oil or tar upon water, of tempered steel, the brilliant colours of lead skimmings, Nobili's metallo-chrome, the flashing colours of certain insects' wings, are all colours of thin plates. The colours are produced by transparent films of all kinds. In the bodies of crystals we often see iridescent colours due to vacuous films produced by internal fracture. In cutting the dark ice under the ture. In cutting the dark ice under the moraines of glaciers internal fracture often occurs, and the colours of thin plates flash forth from the body of the ice with extraordinary brilliancy. Newton placed a lens of small curvature in optical contact with a plain surface of glass. Between the lens and the surface he had a film of air, which gradually augmented in thickness from the point of contact outwards. He thus obtained point of contact outwards. He thus obtained in monochromatic light a series of bright and dark rings, corresponding to the different thicknesses of the film of air, which produced alternate accordance and discordance. The rings produced by violet he found to be smaller than those produced by red, while

the rings produced by the other colours fell between these extremes. Hence, when white light is employed, "Newton's Rings" appear as a succession of circular bands of colour. A far greater number of the rings is visible in monochromatic than in white light, because the differently coloured rings, after a certain thickness of film has been attained, become superposed and reblended to form white light.

On Friday evening, May 14, Mr. W. H. Perkin, F.R.S., lectured upon "The Newest Artificial Colouring Matters," and confined his attention principally to the coal tar colours. These, he said, are all organic bases, and the first of them was introduced about thirteen years ago. He then entered into much of the organic chemistry of the coal tar colours. Among his experiments was one showing the great specific gravity of the vapour of benzole. He placed about a quarter of a pint of benzole in the bottom of a large cylindrical glass jar, and then placed a thick disc of warm iron in the benzole to raise much of it to the state of vapour. The vapour was then poured from the jar into a wooden trough, about 9ft. long, placed in a slightly inclined position. The invisible slightly inclined position. The invisible vapour ran down the trough and was ignited at the other end. Two very pretty experi-ments consisted in the exhibition of the fact that aniline pink and the colouring agent called "Magdala" are fluorescent to the green rays of the spectrum. On Saturday, May 15, Professor Seeley gave another lecture upon "Roman History"; and on Tuesday, May 18, Professor Grant continued his lectures upon "Stellar Astronomy."

### ELECTRICITY AND TELEGRAPHY.

UP to the end of last week, about 2,740 miles of the main French Atlantic cable, and all the shore ends, and the St. Pierre and the United States section, had been completed. The major portion of the cable was on board the "Great Eastern." The fore and main tanks are filled, and a small quantity remains yet to be coiled in. whole of this cable, by the time this is before our readers, will have been completed at Greenwich. The following vessels, as cable ships, will be engaged in the expedition:—The "Great Eastern," "Scanderia," "William Cory," and "Chiltern." The landing place in the United States has been fixed, and steps are being taken for the construc-tion of a land line to New York.

Mr. Newall has just succeeded in laying a short cable between Corfu and Santa Maura, and is engaged in laying some other short lengths in the Grecian Islands.

The joint direction of the Atlantic and Anglo-American Telegraph Companies have issued a notice that after June 1 a reduction will take place in the charge for messages. They will then be at the rate of £2 per message of 10 words, charging for address and signature of sender, and for every additional word, at the rate of 4s. A reduction will also be made in general "Press" messages.

In laying the submarine cable between Born-holme and Liban, a storm came on, and necessitated the cutting of the cable; but on the weather moderating, the laying of the cable was successfully completed from the "La Plata" without difficulty. The "La Plata" is on her way home. On her arrival she will take in at Woolwich the cable now manufacturing for the Peterhead and Norwegian line.

The cable just laid completes a direct commu-The cable just laid completes a direct communication between England and St. Petersburg, via Newcastle, by the cable laid last year by Mr. Newall to Denmark, and across the Baltic to Liban by the two cables laid by Mr. Henley. From Liban there is a land line to St. Petersburg. The Peterhead cable, just completed at North Woolwich, is 285 knots in length, and will be sub-

merged between Peterhead and Egersund, in Norway. Its weight is a little above 2 tons per knot. The conductor is a copper strand, of 180lb. to the mile, insulated with an equal weight of Hooper's india-rubber core. It is served in the ordinary manner, and sheathed with twelve No. 8 iron wires. Of the total length, 10 knots will be of stouter manufacture for the shore ends. This length will be sheathed with ten No. 1 wires.

French Atlantic cable manufactured by Mr. Henley, he has now in hand 52½ statute miles of cable for the Norwegian Government. The core of this cable consists of a strand of copper, 107lb. per mile, insulated with gutta-percha to the weight of 166lb., making a total weight of 273lb. per mile. The sheathing of this cable is 10 No. 6 iron wires. Mr. Henley is also manufacturing a length of 12 knots of 7-wire cable for crossing the Store Belt. Each wire has a conductor of 1071b., insulated with 126lb. gutta-percha. The external

protection consists of 16 No. 5 iron wires.

The British-Indian Telegraph Company have just issued their report. They state that the whole of the capital offered to the public has been subscribed, and that the order, with the first payment, has been given to the Telegraph Construction and Maintenance Company, who have already commenced the manufacture of the core at the Gutta-Percha Works, and, at the date of the report, 250 miles of core had been completed, while about 500 miles were in various stages of manufacture. The manufacture of the cable at the sheathing works at Greenwich had not been commenced, but it is most probable that, by the first week in June, a commencement will have been made.

News from Australia informs us that the paying out of the Tasmanian cable had commenced on April 22, but that a sudden gale had compelled the engineer in charge to cut and buoy the cable. Doubtless, the next mail will bring us satisfactory news of the completion of the work.

news of the completion of the work.

There is every probability of the "Telegraph Money Bill" being brought before the House of Commons at an early date. The arbitration case between the Post Office and Reuter's Telegram Company is now virtually over; the witnesses have been examined, and the counsel engaged made their concluding speeches. The matter is now, therefore, in the hands of the arbitrators and the umpire, and the award is expected in a few days. This being settled, there will, we underdays. This being settled, there will, we understand, be little further delay in completing the estimates for the amount actually required for the

purchase of the telegraphs.

ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL AP-PLICATIONS.

THE CARBURIZATION OF AIR FOR ILLUMINATING PUR-POSES-COAL TAR DYES.

LTHOUGH most of the attempts to procure f A illumination by burning air, saturated with hydrocarbon vapours, have resulted in failure, the many advantages of the plan are so obvious that inventors are certain to go on experimenting, and, in the end, no doubt, all difficulties will be overcome. The last "Bulletin" of the Societe Industrielle of Mulhouse, furnishes us with a report trielle of Mulhouse, furnishes us with a report on the carburetting apparatus of M. Andirain, with which a committee of the Society has experimented. Unfortunately, the committee has neglected to furnish us a description of the mechanism, but they have told us one thing, which perhaps explains the success. The carburetting liquid employed was a very light petroleum having a density of only 650—660. With this liquid, they found no condensation take place in having a density of only 650—660. With this liquid, they found no condensation take place in the pipes travelling 120 yards in the open air, and the illuminating power of the mixed air and vapour was sensibly the same at all distances from the reservoir of hydrocarbons. That this would be the case when very light oils are used, might be supposed, and there can be no doubt that the sole secret of success in carburetting air cas lies in the use of these materials. We or gas lies in the use of these materials. believe there is a great future for this application, and this belief induces us to stimulate inventors to produce an apparatus which will suffice to illuminate a large country house or railway station, where gas is not accessible. Carburized air has some advantages over gas for domestic illumination. The flame is never smoky, and, consequently, does not soil ceilings. The combustible destructive effects of sulphurous and sulphuric acids are avoided. And, perhaps, most important of all, the vapour forms no dangerous and ex-plosive mixture with air, if leakage should take place. For lighting railway trains, carburized air would seem to be peculiarly applicable, as the motion of the train could be made to furnish the blast, which a regulator could easily deliver at any desired pressure. Nor would it be less available for warming carriages in winter, in place of the cumbrous hot-water contrivance, which our rail-In addition to this cable and the portion of the way companies supply very parsimoniously. As



we have said, there is still a good field for inventors in this direction.

Anyone who listened to Mr. Perkins' lecture on the newest discoveries in artificial colouring matters would have been struck also with the large field there is still open for experimenters in this branch of science. Aniline itself does not appear to be yet exhausted, while other bodies are being pressed into the service of the chemist in producing these beautiful dyes. It has been a favourite speculation with some who have adopted Stephenson's notion that coal is but fossil sunlight—that coal tar products would be made to furnish all the colours of the sun's spectrum. The idea is almost realized, but we have a great predominance of red shades. We are reminded of this by reading of a new red, which is now manufactured here, and of which we do not remember to have seen any notice before. The description of the mode of production is, as might be expected, vague, but enough is said to put a chemist on the scent, and show the direction in which the latest discoverers are working. This new rose colour, which is said to give more solid dye than aniline compounds, is, we are told, obtained by the reac-tion of phtalamine on a derivative of napthylamine. This is not very specific information, but it will convey some instruction to a chemist; and the fact that the colour now sells for about £24 the pound may stimulate him to experiment.

In the lecture we have mentioned, Mr. Perkins told an amusing story of an inventor who produced an aniline green, which he was, however, unable to fix. In his despair, he went to a photounable to fix. In his despair, he went to a photographic friend, who, reasoning that since hyposulphite of soda would fix a photographic picture, it might fix anything, recommended the dyer to try that salt. He did, and found it succeed. Apropos to this, we read in the "Mulhouse Bulletin," before quoted, that aniline green is a compound of Hoffman's violets and iodide of mathyl. If the dye is heated in a scaled tube it. methyl. If the dye is heated in a sealed tube it

splits up into these two compounds.

One other fact we may notice in connection with aniline colours. The mixture which produces aniline black, when printed on cloth, it seems, rapidly corrodes the scraper, and unless this is well attended to blotched patterns are obtained. This inconvenience is partly avoided by adding some hydrated oxide of lead to the mixture; at all events, a larger number of pieces can be printed without paying attention to the scraper.

### THE MARTINI-HENRY RIFLE.

AST Friday afternoon, Captain V. D. Majendie, R.A., read a paper at the Royal United Service Institution upon the Martini-Henry rifle. Having referred to the early history of small arms, and to the recent changes in their construction, he came to the immediate subject of the paper. After reading an extract from the report of Ordnance Committee for 1862, he stated that the highest prize awarded in the competition which ensued had been adjudged to the Henry rifle the Martini weapon then standing seventh in the list. The inferior position of the latter was, however, attributable to defects of ammunition, copper fire cartridges having been used in its trial. Daw cartridge was then recommended. This was like the service cartridge, inasmuch as it consisted of thin coiled brass. Unlike the service cartridge, it was secured by soldering the edges instead of cementing them with paper fitted into the base. The whole subject then divided itself into two parts—the one regarding the common denominator parts—the one regarding the common denominator for barrels and the other concerning the method of loading. With respect to the barrel question, the superiority of the Henry rifle had been demonstrated by a preponderance of competent authority, as regarded trajectory, accuracy, initial velocity, and penetration. Other qualifications, he urged, were not to be postponed to those he had enumerated. rated. The Henry rifle, however, did not exclude any of these to which he had last referred. Re-garding loading, it was admitted that the operation should be performed at the breech. In this case mere rapidity was not the only thing to be considered. The durability of the breech mechanism. its simplicity, its safety, its ease of manipulation, its non-liability to injury by exposure or rough usage, were all important in directing opinion on the subject. In the competition to prove rapidity the following was the order of merit:—1, Westley Richards; 2, Martini; 3, Henry; 4, Westley Richards (equal); 5, Berdan; 6, Money-Walker. The exposure test, however, had reduced the competition to the Martini and Henry weapons. The parts in the latter were much more numerous

than those in the former, which was easier of manipulation and also somewhat cheaper. He then explained the construction of the rifle, which will be found illustrated and described in the MECHANICS' MAGAZINE for March 19 last. It consists of a swinging block hinged on a pin, passing through its near end, the recoil being taken by the shoe. The cartridge is exploded by a direct-acting piston, driven by the impress of a strong spiral spring within the breech-block. The moved by the action of a lever to rear of the trigger guard. The motion of pushing the lever forward depresses a block, compresses the spring, and ejects the empty cartridge. When the lever is drawn the block is raised and the breech closed.

Captain Majendie then observed that in the Martini-Henry rifle the advantages of both the separate weapons had been combined. The following argets had been obtained at the following distances:
—300 yards, '47ft.; 500 yards, '79ft.; 800 yards,
1.29ft.; 1,000 yards, 2.19ft.; and 1,200 yards,
2.28ft. He then answered several of the objections made to the adoption of the new rifle. He denied that the face of the block was convex, as alleged by those who condemned it. He also replied to the assertions that if the trigger were full before the block was closed it would fire the cartridge, and that the empty case would be ejected into the face of the rear rank men. In answer to the objection opposed to the use of the spiral spring, he said that this contrivance had been adopted by the French and Prussians, and it was the only part of the Chassepot and needle guns which was not to be altered. Two hundred Martini-Henry rifles would be ready before the Wimbledon meeting this year, and the Enfield plant would be converted at the rate of 400 a-week. The bayonet to be employed with the rifle was the saw bayonet, which was at present used by the Royal Irish Constabulary. This would be useful not only as an ordinary bayonet, but also as a saw and a couteque de chasse.

### THE PROPOSED ABOLITION OF PATENTS.

OUR readers scarcely require to be reminded that just before the Whitsuntide recess, Mr. Macfie gave notice in the House of Commons of his intention to move, after the recess, a resolution, declaring that, in the opinion of the House, the time had arrived when the interests of trade and commerce and the progress of arts and sciences would be promoted by the abolition of patents. In consequence of this mischievous intention on the honourable gentleman's part, Tuesday last a deputation of members of the Inventors' Institute, the delegates invention right committee, and other gentlemen representing numerous industrial associations, composed as follows:—Captain J. H. Selwyn, R.N., vice-president lows:—Captain J. H. Selwyn, R.N., vice-president of the Inventora' Institute; R. Marsden Latham, George Potter, T. Paterson, F. W. Campin, T. J. Dunning, B. Walker, G. F. Savage, J. Hasleton, B.A., and George Druitt, waited on the Attorney-General, as one of her Majesty's acting commissioners of patents for inventions, to solicit his attention to Mr. Macfie's proposed motion in the House of Commons for the abolition of patent rights for inventions. The members of the deputies in processed ways that Attention General, that tation impressed upon the Attorney-General that the interests of the working classes and the status of the country, in regard to the mechanical and chemical arts, would be greatly injured by the abolition of the patent laws, although they unani-mously required that these laws should be simplified and rendered more efficient. The Attorney-General gave every attention to the deputation, and expressed his general concurrence in the views put forward by them, but stated that he did not yet know the policy of the Government on this question, although he individually was opposed to Mr. Macfie's motion. We are certain that such an absurd motion will find but few—if any—supporters in an assembly like the House of Commons. Such potions are not to be talemted. Commons. Such notions are not to be tolerated in the present day. We reserve further remarks upon this question until such a time as the matter is fairly before the country.

The following are the reasons why Mr. Macfie's motion should be negatived in the House of Commons, as submitted to the Attorney-General

by the deputation:-

1. It is the duty of the State to encourage in-

skill, equally as much as the author or the artist is entitled to copyright for his book or work of art.

3. That the patent system, though defective, is the best practical method of remunerating inventors yet devised, inasmuch as under it those persons only who use inventions, and to whom, therefore, they may be assumed to be of service,

4. Experience shows that no system of rewards from the State could ever be made to work satisfactorily, either in the interests of inventors or the

public.

5. The inventor, as distinct from the manufacturer, has a right to be heard before the patent laws are abolished or materially altered.

6. Inventors and specially those belonging to the working classes, to which classes the great majority of inventors belong—are entirely opposed to the abolition of the patent laws, though they earnestly desire their amendment.

7. That by a good system of patent law the progress of the trade and industry of the country would be largely benefited, as the whole inventive talent of the nation will be thereby incited to strenuous and continued efforts to maintain our industrial position against the very active pressure of foreign competition now affecting our commercial prosperity.

8. That working men, who are largely represented by the present deputation, are especially anxious to find themselves in a position, under an amended patent law, in which they can not only safely exhibit their inventions in public, but be enabled to reap the fruits of improved education

and increased application of invention,

# PHENOMENA OF MAGNETIC STORMS.

R. R. H. ALLNATT recently addressed some MR. R. H. ALLNATT recently addressed some remarks to the "Times" upon the clouds in connection with magnetic storms. He says some five or six years ago the Astronomer Royal, Mr. Airy, laid before a meeting of the Fellows of the Royal Society a theory to account for the phenomenon of magnetic storms. "These phenomena," he says, "represent the movements of a magnetic ether which overspreads the surface of the earth as an impalpable fluid envelope several feet in thickness." If we imagine this magnetic ether to be subject to impalpable find envelope several reet in thickness."

If we imagine this magnetic ether to be subject to occasional currents produced by some action or cessation of action of the sun, which currents are liable to interruption or perversion of the same kind hable to interruption or perversion of the same kind as those in air or water, we have a theory by which the disturbances that occur in the observed phenomena by terrrestrial magnetism may be explained. "It would be well," says the late Professor Nichol, "to discuss magnetic observations more from a meteorological point of view than has hitherto been done."

done."

Let us, then, take the clouds, about the specific modification of which so little is known. During the past month a diligent observer might have witnessed the following phenomena:—A thin, apparently homogeneous body of vapour has been driven rapidly up by a S.W. wind, and on approaching a certain well-defined spot about two points N. of N.W., and of about 10deg. of elevation from the horizon, has assumed a succession of ponderous radii, like a huge expanding fan, stretching beyond the meridian. On the 18th these radii co-existed with a vivid aurora, and according to Mr. W. H. Preece, with very strong intermittent earth currents on all long telegraph circuits in the S. of England.

Last night (17th), at 24min. after indigint,

Last night (17th), at 24min. after midnight, another beautiful example occurred. A thin lenticular another beautiful example occurred. A thin lenticular cirrostratus gain bore up rapidly from W.S.W., and on reaching the spot indicated (N.N.W.) assumed a succession of opaque radii with illumined interspaces. The N. horizon was clear. These perpetually recurrent radiating overcloudings are a mystery. They have more effect upon the needle than tempests themselves. The question is, are these peculiar forms of condensation the cause or effect of the magnetic perturbation? Colonel Sabine says that the perturbation is the effect, and that it is a purely magnetic fact, the explanation of which depends on that of the physical cause of solar and terrestrial magnetism. All the phenomena hitherto known of the diurnal magnetic variations have been explained magnetism. All the phenomena hitherto known of the diurnal magnetic variations have been explained by supposing that the sun acts upon the earth as a very powerful magnet at a great distance. When will the "experimentum crucis" be made?

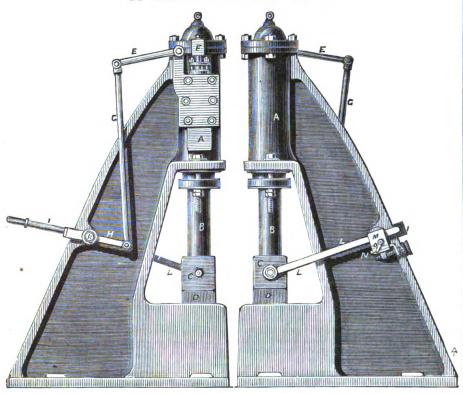
M. MEGE-MOURIES states that brown bread is a compound of coloured matter, produced by the action. of a ferment he calls cerealine. By preventing the action of this ferment, brown bread is converted into vention by every legitimate means, in order to enable this country to maintain its supremacy in mechanical and chemical arts.

2. That the inventor is entitled to reasonable remuneration for his labour, expenditure, and



# SINGLE-STANDARD SELF-ACTING STEAM HAMMER.

BY MESSRS. J. BARRANS AND CO.



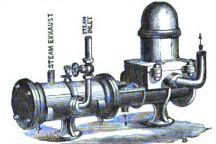
### SELF-ACTING STEAM HAMMER.

THE annexed engraving represents two views of a very neat single standard self-acting steam hammer, by Messrs. J. Barrans and Co., of the Steam Hammer Works, Whitehall, Sheffield. A is the cylinder, B the piston rod, and C the tup, which is forged solid at the end of the rod, D is a loose anvil block, which fits into the standard, E is the valve lover, one end of which works through the valve lever, one end of which works through the valve spindle F, and the other end is connected by the rod G to the lever H, which is worked by the handle I when working by hand. When working self-acting, it is fastened by a steel screw at the under side of the boss to the die box shaft K, which passes through the hammer side, working in two bosses, cast on for the purpose. L is the tup lever which works on a steel pin through the tup, and passes through the adjusting box M, and thus gives motion to the valve as the tup rises and falls. It is adjusted by means of the wedge N, by which adjustment the travel of the valve is varied, thus altering the weight of blow and length of stroke as required. The small handle O holds the die in position when adjusted. These steam hammers are already in use at more than a score of engineering works, where they are giving every satisfaction, and the manufacturers are constantly receiving new orders.

# STEAM PUMPS.

N American invention of considerable interest has lately been introduced into this country by Messrs. Hayward, Tyler, and Co., of Upper Whitecross-street, in the shape of a steam pump. It belongs to the class in which there is no rotating motion. In this particular, however, there is nothing especially new, there being many pumps working without flywheels or crank shafts. The chief point of novelty in this instance consists in the extremely simple method of working the slide valve without the aid of cams, spring valves, levers, tappets, &c., the use of which in most cases has been a source of trouble and annoyance. In this case the reciprocating motion of the piston is case the reciprocating motion of the piston is effected in a very simple manner, though, owing to the working parts being within the piston itself, it may not appear so at first sight. The piston is elongated to about the length of its stroke, and contains within it a cylindrical slide valve, which, together with the piston itself, contains steam, supplied to it by a slot on one side of the piston. In the main cylinder are placed ports correspond-

ing to others in the piston. These are so arranged that when the piston arrives nearly at the end of that when the piston arrives nearly at the end of its stroke, by the ports coinciding, steam is ad-mitted to one end of the cylindrical slide valve, causing it to change its position to the opposite end of the main piston, and by this means reversing its motion. The same thing occurs when the piston reaches the opposite end of the cylinder. It will be seen that no parts come in contact with each other, the whole being effected by one port passing over the other. The motion thus produced is steady and perfectly noiseless the speed of the steady and perfectly noiseless, the speed of the piston varying from 10 to 300 strokes per minute.



It will thus be seen that there are only two moving parts in this machine, which is represented in the

above cut.

The whole being self-contained, no bed-plate is requisite. Moreover, as all the working parts are covered, this engine can be placed in dusty places where machinery having bearings, pins, joints, &c., would soon be destroyed. The only visible moving part is about a couple of inches of visible moving part is about a couple of inches of piston rod, passing between the steam cylinder and the pump. The valves of the pump are also well arranged, being on a flat surface under the air vessel, by the removal of which they are accessible without breaking any pipe joints whatever. We recently paid a visit to the works of Messrs. Hayward, Tyler, and Co., where we saw one of these pumps at work, and were much pleased with its action. It worked equally well at slow and quick speeds. Taken apart, the simplicity of the action is at once apparent, although it must have exercised the ingenuity of its inventors—Messrs. Cope and Maxwell—to perfect it. In the United States, we understand, there are a great number of these pumps in use; this cannot fail to be the case these pumps in use; this cannot fail to be the case in England when its merits become known. A working model of this pump was exhibited at the conversazione of the Institution of Civil Engineers last Tuesday evening.

### AERONAUTICAL SOCIETY OF GREAT BRITAIN.

A GENERAL meeting of members was held in the rooms of the Society of Arts, on Thursday evening, the 20th inst., for the reading and discussion of papers. The chair was occupied by Mr. Glaisher, F.R.S.

The Chairman said he was sorry to have to announce that the Duke of Argyll was unable to take the chair, as he would have done, had this meeting taken place during the time he was in London; but, considering how oppressed he is with work, they would not begrudge his Grace his journey to Scotland. It was now a long time since the Society had met, but from the nature of its objects, viz., to obtain aerial navigation, they could scarcely expect that their meetings should be frequent, and they were by no means anxious that they should be frequent. The subject was entirely dependent on experiment. Theorists and mathematicians told them what to do, but practice proved that theorists do not agree. Experiments must be carried out by mathematicians, with the aid of physical science, or they could not hope to succeed. At the present moment, a number of gentlemen were engaged in these experiments, but from the requirements of other duties, they had not much time to

devote to them.

To these he might say "go on," for, although they might not have much effect in one time, he never found, in his experience, but that some good followed from continued experiments. They should never forget that Sir William Herschel, when he discovered double stars, was first engaged in attempting to ascertain their distance from the he soon found this indication to be fallacious; yet, starting from this error, he was quickly led to the discovery in question. So he believed that experiments inaerial navigation would increase our know-ledge, one way or another. They met that night under peculiar circumstances, there being in London at this time the largest balloon yet made. The original discovery of the balloon was due to France, and to the enterprise and courage of Frenchmen they were indebted to the balloon now at Ashburnham Park. M. Giffard had selected for management persons in whom he had confidence, one of whom was M. Godard, and he had placed the balloon at his (Mr. Glaisher's) disposal, to use in any way he thought proper, to increase aeronautical knowledge. They had there an opportunity, such as they never had before, to take observations, and he was sure that the members of the Society would avail themselves of a visit to Ashburnham to see this balloon. selves of a visit to Ashburnham, to see this balloon, which was made strong enough for rising under different forces of wind. That balloon had spoken to him trumpet-tongued. All his life he had been accustomed to weigh the air, and he had weighed it by a barometer, and in a balloon, and always by grains, and in winter he found the cubic foot to be about 570, and in summer 20 or 30 grains less; but when they took grains, they thought the air light. When he saw, the other day, that the balloon would lift 16 tons, or more, and when against the laws of gravitation it could raise so much, there must, he thought, be something for members of the Society to study. When they looked at the fact there are 420,000 cubic feet of gas in the balloon, they would see what was the motive power; he trusted they would have some papers of interest that night, but if they were to be progressive, though it might be slowly, it must be by experiment.

Mr. Frederick W. Brearey said he would first-ead the following communication from Captain Murray, R.N., one of the members :- "In enclosing my subscription for the current year, I would ing my subscription for the current year, I would suggest that, as at present, the Society and its members are groping in the dark, for want of any knowledge of the fundamental relation between pressure and velocity of air. They should offer a substantial prize—of not less than £100—for a complete and general solution or rigid mathematical principle of the following problem:—'Required, the relation between the velocity of a current of air and its pressure on a plain surface of given size, shape, and inclination.' Should the Society see fit to adopt the suggestion, I will contribute £10 towards raising the necessary fund. The £10 towards raising the necessary fund. The problem is one of exceeding difficulty, but there are, probably, a dozen men in the country competent to apply to it the most subtle method of modern analysis, with a fair chance of success; and, when solved any one of groad recebusical country. when solved, any one of good mechanical capacity will be able to say at once what can and what-cannot be done in the way of flight. For my own part, I have little doubt that the result will show that the power of a man can be so applied as to

sustain himself and his apparatus—weighing (say) 200lb.—at a high speed. I have attempted the problem myself, but the result has been to satisfy me that it is a hopeless task for any one not gifted with the very highest mathematical capacity to attack even the simpler cases of it. It seems to me that for the Society really to further the great object which they have in view, they must attack this problem either as I propose, or experimentally, at a great expense, and with less certain results."

The Chairman said that no doubt Captain

Murray was quite right in his views upon this matter, for they knew that the mathematical problem connecting velocity with pressure had to be solved, yet it was found by experiments that results did not quite accord. If they took a square inch of surface and a square foot of surface with the same velocity they did not get the same results. It was in this direction they required experiments to be made. Perhaps Mr. Brooke, who had paid great attention to this, would say some-

thing upon the subject.

Mr. Brooke, F.R.S., remarked that the fact is lost sight of, that when velocity of an opposing surface has done its work upon the air, this has to get out of the way, and that would much depend upon inclination of surface. This, he thought, was

not thoroughly understood.

Captain Murray said that the problem he had 80.000 sted had never really been attacked. actually worked out it would be found that theory and experiment correspond. No theory would say that the pressure on a square inch is the same

as the pressure on a square foot.

M. de Fonvielle (editor of "La Liberté") suggested that the pressure and velocity of wind can be obtained by the use of an anemometer in the captive balloon, by deducing the force on a plain surface from the known difference of result on a sphere, to which figure the balloon in question closely approximated.

The Chairman said he intended to consult Mr.

Zambra on that point.

Mr. Quartermaine said he saw no more difficulty in estimating the pressure of the air than in cal culating the pressure upon a steam boiler. At the same time, it should be borne in mind that in aerial navigation they had to deal both with resistance and with the air following up.

Mr. Olrick said that no doubt a number of ex-

periments are required to determine velocity and pressure, as it is found that various theories on the subject are not substantiated. With regard to aerial navigation, it should not follow that, as Scott Russell pointed out, the wave line is the best for a ship, the same line should be best for aerial machines. He cited his explanation of the ingenious contrivance in Giffard's injector, the action of which many engineers had attempted to explain, and he submitted that his formula on that invention agreed with practice.

The Chairman said he did not say that pressure and velocity are not connected. Doubtless, they are; but in the experiments at Greenwich they vere unable to connect them; and when Mr. Scott Russell and he tried the results of the two, they

were not identical.

Mr. Thomas Moy spoke upon the relative power and surface in mechanical flying machines with mathematical diagram for computation, upon the thrust of aerial screw propellers, and upon the flight of the albatross. He prefaced his remarks flight of the albatross. He prefaced his remarks by reading an extract from a book by Wilkins, Bishop of Chester, published in 1683, in which the right reverend prelate stated his belief that an aerial chariot might be made by a man who had leisure enough, on the same principle as Archytas made a wooden dove, and Regiomontanus a wooden eagle. This extract Mr. Moy urged as evidence that a belief existed, at that early that a wooden dove and a wooden eagle had been made. Mr. Moy then explained to the meeting a diagram which he had prepared for calculating the proportion of sustaining surface in relation power for mechanical flying machines. The table showed, in a very simple manner, how many square feet of surface would be required to sustain a machine of 100lb. weight, beginning with 1-horse power to that weight, and going as high as 4-horse power, the amount of surface being readily seen as represented by a curve of the hyperbolic order, and the pressure per square foot being shown by another curve. He remarked that he thought this table would be quite sufficient for present purposes, as it was not likely to be exceeded in either direction for some time, the lowest power being, according to this calculation, 1-horse power —1,455 square feet of sustaining surface, and 1-1oz. (loz. and 1-10th) to the square foot; and the highest being 4-horse power—91 square feet,

and 17 to the foot per 100lb. weight. table being drawn to scale, any intermediate calculation between these two extremes could be obtained by simply drawing a parallel line across the proportionate power in the column for horse power, and continuing such line across the two The thrust of the screw propeller was Mr. Moy's next subject, and he remarked that the analogy between a ship and an aerial machine was not so close as many persons seemed to think. A screw steamer on starting from a state of rest exerts but a very small proportion of her power, and only obtain the total effect of her power when at full speed; but the aerial machine requires the exertion of its full power at once, in order to rise. This he explained by showing the thrust at different angles to sustain 100lb. :posing, first, that the angle is 45deg. to start with and the speed 10 miles an hour, the thrust would be equal to the load, 100lb.: but as it gathers way the thrust decreases, and when going 17 miles an hour, the angle would be reduced to 30deg., and the thrust to 58lb. Going on again to 27 miles an hour, the angle would be reduced to 20deg., and the thrust to 36.71b.; and still further incre the speed to 59 miles an hour, the angle would be 10deg., and the thrust only 17lb.; and in each instance the power exerted is the same, but the mode of applying it varies, for at first starting a powerful thrust is required at a comparatively low speed, but afterwards, when in rapid motion, a light thrust at a high speed; whereas, in the case of a ship, a small amount of thrust is sufficient to put her in motion, and the thrust increases with the speed. Mr. Moy next gave an explanation of the modus operandi of an albatross scaring over the waves of the sea for many miles, without any apparent effort on the part of the bird. He mentioned the fact that the waves are caused by the wind impinging upon the surface of the water. The wind, as it were, attempting to travel in a straight line, is deviated therefrom by the earth's globular form, and thus, impinging at a tangent, the wave is caused; and the greater the force of the wind, of course, the greater must be the body of water heaped up to shunt it upwards. This imparts to the wind just above the waves a wave motion, and Mr. Moy considered that the bird soared across the valley of the wave, and when it arrived over the apex, it got just what it wanted without any exertion, viz., a small upward current of air sufficient to lift and propel it to the same extent as a beat of the wings would do in a straight current. Lastly, Mr. Moy closed his remarks by observing the difficulties which model flying machines laboured under. He said that if we attempt to make a small model to scale of the "Great Eastern," the cylinders, &c., would have to be as thin as paper, which would impossible, and unless the scale could be kept throughout, the proportionato results would not be fair; and if that meeting had been convened in order to show by model, for the first time, the practicability of working rail-ways, the proportionate results would not be in the least expected. We know that a locomotive engine can draw a load equal to ten times its own weight, but the model locomotive would satisfy us if it drew only a load equal to itself, and no one would on that account deny the practicability of railways. But with the model flying machine no 10 per cent. will suffice; it must lift the last ounce, or it is pronounced a failure. If it resists gravitation 10 per cent only it is laughed at; it must fly, or it is nothing. This demand requires a higher perfection in the model than in the actual machine, and Mr. Moy stated that to him the actual steam flying machine would be very much easier to construct than the model. Mr. Stewart Harrison expressed his doubts as to

the reliability of some of the theoretical calcula tions of the reader of the paper, and stated his impression that chemistry might help us to as tain approximatively the amount of force expended by birds in flight. If, for instance, a man asserted that he had walked a thousand miles, and, during that time, had only been sustained by the consump tion of half-a-quartern loaf, the statement might fairly be doubted. No force could be exerted without change and destruction of muscular tissue, and the amount of force expended could be measured by the waste of the body exerting that force. therefore, during the emigration of wild ducks and other birds which passed over hundreds of miles in their flight, they exerted anything approaching the theoretically calculated force, they must have expended enough muscle to use themselves up nine or ten times over. He therefore concluded that the power exerted in flight was much smaller than usually supposed, and suggested the possibility of experiments on the waste of the

bodies of birds, to ascertain the amount of force actually expended during a given flight. Assuming that much less power was required than was usually supposed necessary, he stated that hitherto, as far as he was aware, all flying machines had been attempted to be worked by the arms. He considered that the legs in man could exert a much greater furce continuously than the arms; and expressed his opinion that a machine of the nature of a velocipede might be constructed with an aeroplane to act as a plane. This, with a speed of twelve miles per hour, would relieve the wheels of some portion of the rider's weight. Further, he would not be provided in connection with the few wholes. would provide, in connection with the fore wheel, a pair of propellers, with their long blades like the wings of the albatross in shape, turning in con-trary directions on each side of the rider in the position of wings, so as to prevent the tendency to twist round on the part of the whole machine, which would exist were one propeller only pro-vided. These would be so placed as to give a for-ward movement to the machine, as well as a slightly upward movement. He advocated the propeller form, inasmuch as he believed that all experiments hitherto tried had been with propellers, attempting a vertical ascent, the axis being in the line of motion—a condition which was widely different motion—a condition which was widely different from that of a propeller travelling through the air at a rate of ten or twelve miles an hour, and therefore exerting its force against a fresh and undisturbed column of air at every evolution. The failure of propellers attempting a vertical ascent was to be expected by the analogy of wings, for were a strong flying bird like a wild duck released at the bottom of a large chimney shaft, it would never reach the top by vertical flight. In conclusion, he expressed his firm conviction that a practised gymnast would be able to raise himself a practised gymnast would be able to raise himself from the ground on a velocipeds by the combined agencies of the original speed, the aeroplane tail, and the propeller wings. If he did not succeed in raising himself, the experiment was well worth trying, in order to see how much of the rider's weight was taken up by these agencies, and thus acquire data for further experiments with forces greater in proportion to their weight than that of the muscles. He, however, fully believed flight was possible to man by the agencies he had named.

Mr. E. W. Young, referring to Mr. Moy's remarks concerning the assistance which he assumed the ablatross derived in its flight from the upward current of air produced by the glancing of the wing from the slope of the wave, stated that he had observed the albatross skimming the ocean in all directions, with the wind, as well as against it; but that if Mr. Moy's hypothesis was correct, the albatross should be able to soar easily only when going against the wind. In the second place, he recommended that Mr. Stringfellow, whose apparatus he considered the most promising yet before the Society, should fly his model in a high wind as he would a kite, but with a horizontal string. He might then set his propelling apparatus to work, and if his model was able to advance against the wind, so as to slacken the string, mechanical flight would be accomplished without risk to the model.

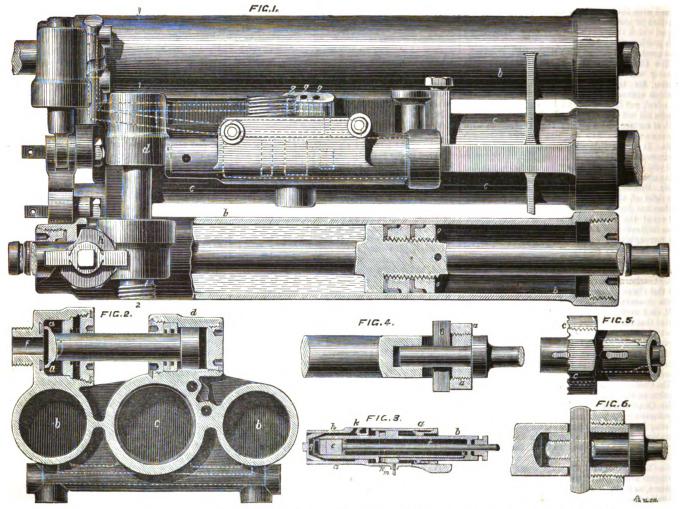
Mr. Young stated that during the summer he had made some rough experiments upon the lifting effect of the wind upon an inclined surface. apparatus was furnished with a vane working on an universal joint, to show the exact direction of the current of air, as the current of air seemed to move in waves over the surface of the ground, and that he had noticed the pressures at those movements when the vane was horizontal. This was a very necessary precaution, especially when dealing with a vane inclined at a small angle with the horizontal. He also stated, for the encouragement of others to make further experiments, that he had found, with a vane inclined at an angle of 12deg. with the horizontal, that the vertical lifting effect of the wind was about one-half the pressure which it exerted against the same vane placed vertically, i.e., if the wind were blowing with a force equal to 11b. per square foot against a vertical surface, it would exert a lifting effect of \$1b. per square foot on a surface inclined at an angle of 12deg. with the horizontal. This was merely approximate, but it was what might have been expected from careful observation of the flight of birds. He had, with the assistance of a mechanical friend, designed a more delicate apparatus for making the same kind of experiments, which he hoped at some future day to complete. and he believed that it would be found that mechanical flight by man could be effected without the necessity of such great speed as some antici-pated.

(To be continued.



# ROCK-BORING MACHINERY.

BY MR. F. B. DOERING.



# ROCK-BORING MACHINERY.

MR. F. B. DOERING, of Victoria-street, Westminster, who has taken a leading part in the development of rock-boring machinery, has recently patented some further improvements in this apparatus. The first part of his invention in engines of this class relates to means of regulating the forward movement as the work progresses of the main cylinder in which the piston carrying the tool works. In our engraving, this part of the invention is represented in longitudinal elevation, partly in section, in fig. 1, and in transverse section through the line 1—2 of fig. 1 in fig. 2. It mainly consists in regulating by means of a piston valve a, the supply of water or other fluid to, and the outlet of such fluid from, a pair of cylinders b b, attached to the main cylinder c, the valve a being worked by a piston in a cylinder by motive fluid distributed from the main cylinder to the small cylinder d, the piston of which is connected to the valve. Instead of attaching the adjacent cylinders to the boring cylinder, the pistons of these cylinders may be attached to the working or boring cylinder, the adjacent cylinders in this case being fixed. The adjacent cylinders b b have each a fixed piston e, and a supply of compressed air may be maintained at the front. So much of each of the cylinders as is behind the piston or pistons is filled with water. A tube connected at f leads from the piston valve a to a reservoir containing this water or fluid.

The action of the engine is as follows:—Supposing the main cylinder c and adjacent cylinders b b are at the back end of their travel, whenever the tool as it continues to work has cut to a sufficient depth to allow the main piston to uncover a port in the main cylinder communicating with the cylinder of the piston valve a, this valve moves and allows part of the water in the adjacent cylinders b b to escape under the pressure of the compressed air on the other side of the fixed pistons e e, or under the pressure due to the weight of the machine if the same is working downwards. The adjacent cylinders and main

cylinders are thus caused to advance, and this advance takes place intermittently according to the quantity of water which escapes from the valve until they reach the forward end of their travel. A cock at the front part of the adjacent cylinders is then opened to let out the compressed air, and pressure is exerted on the water in the reservoir to force the water through the valve into the adjacent cylinders, the small cylinder d exhausting into the main cylinder to allow the valve a to be moved by the pressure of the water, the piston of the main cylinder being put into the required position. The pressure of the water in the adjacent cylinders causes them and the main cylinder c to run back on their supporting bars to recommence their forward travel; the valve a is then closed, the cock at the front end of the adjacent cylinders is reversed, and the pressure in the water reservoir is removed.

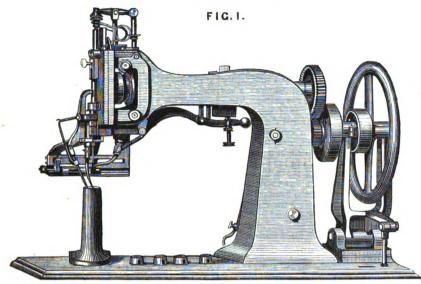
When the engine is working vertically or nearly so the employment of compressed air in the adjacent cylinders may be dispensed with, as the weight of the engine will be sufficient to effect the feed as the tool cuts. Again, instead of compressed air in the adjacent cylinders, a vacuum may be created in the water reservoir connected with the valve. This application of water to regulate the advance of a boring engine may be applied directly to the advance of the boring tool, as shown in fig. 3, the cylinder a being stationary and the piston rod b forming a cylinder in which a piston c attached to the boring tool moves. Water is placed in the front portion of the piston rod at f, and a pressure of the motive fluid acting on the back of the piston at g being constantly supplied through b to keep it pressed against the water so as to advance when the water or a portion of it is discharged through b. In this case, the valve for the discharge is formed by the piston. This discharge can only take place when the tool has penetrated to such a depth as to allow the port b to communicate with b. A circular groove is cut in the piston at b to regulate or adjust the engine for working in materials of different hardness or softness.

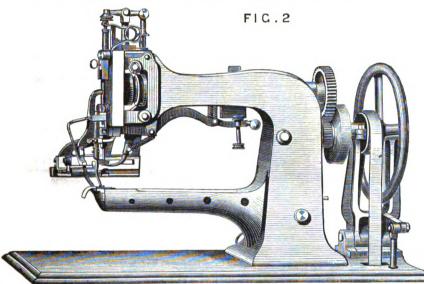
The ports g g g in the main cylinder are formed at various distances from the cylinder end, and communicate with the passage leading to the advance cylinder d through a cock common to all these ports. According to whether the material operated upon necessitates a short or long stroke, the cock is turned to open the way between the advance cylinder and one or other of the ports to produce the advance of the engine when the main piston has passed this port in its stroke. Instead of employing a cock common to all these ports, Mr. Doering provides plugs by which he can close all the ports except the one required for work. It is also sometimes desirable to alter the position of the ports in the main cylinder for working the valve; this may be effected by a cock h arranged similarly to that before described, or the communication between the cylinder and its valve piston may be throttled or wire-drawn.

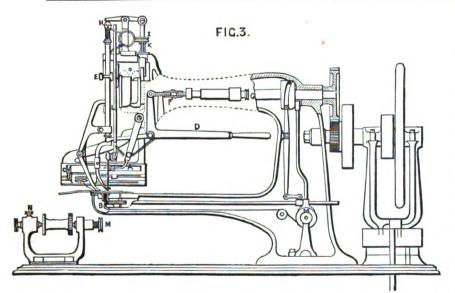
Mr. Doering's invention consists, secondly, in an improved mode of securing the tool in the end of the piston rod. For this purpose he threads the end of the piston rod or socket, as represented in fig. 6, to receive a nut a, and makes the position for the ordinary key b adjustable. He screws up the nut a, and then drives in the key which jambs against it. He thus compensates for wear, and is enabled to dispense with washers as usually employed. In some cases he forms grooves in the nut as shown at c, fig. 5, to receive the edge of the key. The nut is thus prevented turning. He can also employ a nut on the inner end of the tool head, as shown in fig. 6, and can also form the rod of the main piston hollow, and pass the tool down it, securing it by a nut and key, as shown in fig. 5. A model of this machine was exhibited by Mr. Doering at the conversazione of the Institution of Civil Engineers last Tuesday evening.

THE gold medal for physical geography, offered by the Royal Geographical Society to the great schools of England and Scotland, has this year fallen to Rossall, and has been won by Mr. William Grundy, who was for five years at St. John's Foundation School for Sons of Clergymen, at Clapton.

## "CRISPIN" BOOT AND SHOE THE MACHINES.







THE "CRISPIN" BOOT AND SHOE MACHINERY.

FROM the earliest times down to the present the occupation of the shoemaker has been carried on by him while sitting on a low stool. It was in this position that a sandal maker was represented in a painting discovered on the walls of Thebes. It is in this position that the disciples of St. Crispin are, for the most part, to be found working in the present day. How much longer

this cramped and unhealthy position is to be re-tained throughout the trade we cannot say, but before we close this article we shall show that if

many departments of manufacture, and that instrument has been the means of lightening the labours of the working bootmaker. It first helped him in the tedious operation of sewing together the leather for the uppers—technically called "closing." Next, the upper was attached to the sole by the same means. This was in 1859, when a Mr. Blake patented in England an improvement in the Wiskersham sewing machine, an American invention. invention. The upper, however, was attached directly to the sole without the intervention of a welt, which resulted in a very rigid boot which wa very difficult to repair. It is true, we have had riveted and pegged and screwed boots, but, being easily made, the work was often entrusted to boys, who produced anything but comfortable boots and shoes. The riveting, also, was difficult to repair, re-soling meaning almost re-making.

It therefore followed that boots were almost universally made by hand, at considerable cost to the purchaser, and without any relief to the producer from the uncomfortable and cramped posi-tion in which he was obliged to work. This con-dition of things led Mr. John Keats, of the London Mills, Leek, Staffordshire, in conjunction with Mr. W. S. Clark, in 1863, to design a machine which should admit of the use of two threads, waxed with should admit of the use of two threads, waxed with shoemakers' wax, and which should, in fact, manufacture welt sewn boots, equal in quality to hand sewn, although less in price. This invention, in conjunction with a patent taken out in the same year by Messrs. W. and J. Keats, forms the basis of the "Crispin" sewing machine, which, in its perfected state, we have illustrated in the annexed engravings. The leading features of this machine are the computation of a book and a shuttle instead of a needle bination of a hook and a shuttle, instead of a needle and a shuttle. This arrangement allows of the thread being thoroughly saturated with the wax, which does not get squeezed out, as in passing through the eye of a needle. Further, the hole made in the leather is no larger than the ize of the hook, because it has no thread in it while piercing the material. Thus, a thicker thread can be used than with the needle. The stitch, which is formed on the surface of the leather, is a twisted lock stitch, one of the firmest made. The machine is arranged to be driven by steam power, and the

is arranged to be driven by steam power, and the motion can be instantly stopped by a foot lever at any point of the stitch, so that the workman has the free use of his hands.

We have illustrated the Crispin machines in our engravings. Fig. 1 is a perspective view of the "post Crispin," which is used for boot sole sewing. Fig. 2 shows the "arm Crispin," which is employed in heavy work, such as closing heavy uppers, belt-sewing, harness work. &c. This machine is shown sewing, harness work, &c. This machine is shown in section at fig. 3, which gives a clear view of its details. The modus operandi of this apparatus will be seen from the following. The hook is first fixed by turning the machine by hand until the line cut across the edge of the needle bar l at the lower end (pointed at by the arrow) is on a level with the bottom end of the slide, and then fixing the hook with its point on a level with the point of the divider a, care being taken to have the notch which receives the thread at right angles with the arm of the machine. After the large bobbin is charged with thread and placed in position, the cover and hook plate at the end of the arm are drawn off, and the thread brought over the guide pulleys until it reaches the pulley b; it is then passed through the eccentric hole in the small gear wheel. The thread is then drawn forward and passed through the hole in the drawn forward and passed through the hole in the hook plate, the cover and plate being replaced. To thread the shuttle, the bobbin has to be placed in it, with the long centre end foremost. The thread is then passed through the upper slot over the bar and through the lower slot, and then through one of the round holes. The operator then places the shuttle upon the slide, and puts down the hinged stop c. He raises the pressure foot by means of the lever d, and puts the work under the hook so as to be moved from left to right. After the machine is charged with waxed thread, the gas is turned on, and lighted through the holes in the side of the arm, and also the jets behind the shuttle race, until the machine is sufficiently warm to make the wax soft, care being taken not to let the flame come in soft, care being taken not to let the flame come in contact with the casting, as this produces soot, which destroys the heating power of the gas.

A counter-shaft mounted in the frame under the table being put in motion by the driving belt, the machine is started by pressing the foot lever, there-

before we close this article we shall show that if retained for any unreasonable length of time from the present, it will only be due to blind prejudice and wilful obstinacy. This change is simply the result of the application of machinery in a direction where it has long been wanted, but where, up to the present time, at the best, it has been but partially and imperfectly applied. The invention of the sewing machine was the signal for relief to

and kept to push in the required direction by the round vertical bar being pinched with the thumb screw e; an angle of 45deg. to the arm is found most convenient. The pressure is adjusted to the thickness of the work by means of the double screw nut f. The amount of pressure is adjusted by the screw g. The feeder is adjusted to the thick-ness of the work by turning the screw h. The length of the stitch is regulated by turning the screw i, which is secured by the lock nut k. To remove the large bobbin, the pin n is taken out tension spring then forces it out.

The inventors first commenced to use their machine for closing heavy uppers, afterwards it was resolved to make welted sewn boots. veloping this manufacture, a series of important improvements were introduced by Mr. Thomas Greenwood (of the firm of Greenwood and Batley, of Leeds), and Messrs. Keats, patents for which were obtained in 1866 and 1867. Since that time, the system of machine-made boots has been practically developed in the works of Messrs. Keats, at London Mills, and it has now attained to perfect success. We can ourselves testify to the of the work, having given both light and heavy boots made by the Crispin machine a fair trial. The work stands, they wear well, and are much more comfortable than some hand-made boots we have in ordinary wear, whilst the prices compare very favourably with those we have hitherto paid. Messrs. Keats are now carrying on a very large manufacture, which, by an extensive system of machinery, is complete in all its details. They now make every description of goods, from the heaviest clump sole to the child's shoe, as well as a great variety of pumps, or single sole boots. Their latest production is the "Eureka" boot, which aims at—and, we think, reaches—perfection in walking gear. The object is to render the walking boot practically waterproof, and to do away with the uncomfortable inertia to which the side elastic subjects the ankle joint. The front part of the boot folds back and forward again under the lap of the back part, which is continued forward and fastened with a buckle. This arrangement secures a fit round the ankle joint, and prevents the foot slipping forward in the boot by the yielding of the elastic.

In the "Crispin" process of manufacture the last is so constructed as to be variable, by the insertion of wedge-shaped middle pieces; thus a special last is not needed for every foot, although of course, there are various sized lasts. After selecting a suitable last, metal base patterns are prepared, from which the upper parts of the boot are cut. The uppers having been closed are adjusted to the insole and a welt is held to their outer edge, the whole being sewn together by the Crispin sewing machine, one seam taking only thirty seconds to complete. The welt is then turned over and adjusted to a sole, the two being sewn together in the same time as the previous operation. the four seams of a pair of welt boots thus taking two minutes to sew. This work, when done by hand, occupies about an hour and a-half. The feather is then formed in a few seconds, the result of this operation being to conform the upper to the contour of the outsole, and to make the insole perfectly smooth. The boot is then taken to the lasting machine, the last being inserted by mechanical pressure. This process insures a perfect fit, as the upper is not unduly strained in any one The heel is then sewn on by the Crispin machine, after which the boot is sent to a paring machine, where the edges of sole and heel are trimmed up. It is then ready for finishing off in the customary way. Thus, from first to last, we have boot making performed well and thoroughly by mechanical means. The manufacture is by no eans experimental; it is practical, and the machinery at Messrs. Keats' works is capable of turn-ing out several thousand pairs of boots per week. They have competed successfully with the makers of hand-sewn welt boots in contracts for the supply of boots to public bodies, and they have a large private trade at home and abroad. By a method of self-measurement, arranged upon the metric system, by Messrs. Keats, boots can be supplied to persons at any distance who can send their instructions by post. Of course, all this per-fection was only attained by a long and tedious process of development, in which Messrs. Greenwood and Batley, as machinists and co-inventors with Messrs. Keats, had no small share. The rewult of a combination of the inventive talent of the latter with the mechanical genius of the former gentlemen has resulted in the realization of a new a in the ancient art and mystery of boot-making, highly ereditable to the inventors, and beneficial to the public.

THE CAPTIVE BALLOON FREE.

GIFFARD'S magnificent balloon, which was fully described in our last impression, made escape from captivity last Tuesday afternoon. It had made an ascent with ballast only in the car. previously to taking up a company of aerial voyagers, as is the usual practice to make sure that all is safe. The wind, however, was very high, and carried the balloon over to a very sharp angle when near the ground. The grooved pulley, over which the rope passes, failing, somehow or other, to follow the angle of the rope sufficiently quick, the latter slipped off, and the strands became damaged on the edge of the pulley. Thus weakened, the ascensional power of the balloon, aided by a stiff breeze, soon severed the rope, and the balloon shot upwards. We are glad to learn that it has since been secured, near Aylesbury, although we regret that some slight damage has befallen it. Observations made in the neighbourhood of Aylesbury show that the balloon came from the direction of Aston Clinton and Tring, and passed a little to the north of the town of Aylesbury, going westward. It bore for the Waddesdon and Winchendon range of hills, and by Tring House, Hogshaw, and North Malston, past the Grandborough-road Station, on the Aylesbury and Buckingham line of railway, to a farm in the parish of Botolph Claydow. The balloon, after passing the Winchendon hills, showed signs of partial exhaustion, and for four or five miles the portion of rope attached to it dragged along the fields and against the hedges. It then proceeded on again, coming into contact with some large elm trees on Bernwood Farm, on the estate of Sir Verney, with which, after tearing away some large branches, it became entangled. It was eventually secured by the inhabitants, under the direction of Sir Henry Verney, and the manager's staff have since taken charge of the monster. No apprehension need be entertained as to the safety passengers if the balloon had broken loose during the ascent of a party, because, in that case, MM. Godard and Aymo would have been in the car, and would have landed the balloon and passengers in safety within a comparatively short distance of Ashburnham Park.

#### GUNPOWDER HAMMER AND PILE-DRIVER.

T a late meeting of the Franklin Institute A there was exhibited a gunpowder hammer, invented and constructed by Mr. Thomas Shaw, of Philadelphia, and to which implement we recently briefly referred. In describing the apparatus, Mr. Shaw said:—Among the first and most useful mechanical instruments is the hammer; but the muscular effort necessary to throw the ordinary hammer is too expensive to permit this mode of operation to be universal; hence other sources of power have been called into requisition, such as wind, water, and steam, and it is now proposed to add gunpowder to the list. In the introduction of gunpowder for operating hammers, several advantages over all other sources of power are secured In the employment of a concentrated fue combined with a sufficient supply of oxidizing materials to make its combustion independent of artificial or natural draught. 2. In the completeness with which the principle of expansion that can be brought into play, without cut-off valves or complications of machinery, and as it is only at high pressures that the value of expansion becomes prominent, we here have it to the fullest extent. 3. In the readiness with which the machine can be started. Its going into action being simultaneous with the ignition of the fuel, and the immediate cessation in use of fuel with the stoppage of the work. 4. In the simplicity of the machinery; for while the gunpowder hammer is the most powerful, it has not the tenth part of the complications of other hammering appliances. 5. In its controllability; for this most powerful of all operative forces can be regulated by a child. 6. In economy, for it is less expensive than other machines, because the fuel is employed to the best possible advantage, and because the heat is not radiated and lost from innumerable surfaces

The modus operandi of bringing about these results is as follows:—A weight or hammer is suspended between vertical guides, and is provided on ts under side with a plunger that fits into the bore of a cylinder held between the same guides beneath the hammer. It is intended that the cylinder should rest upon the object to be pounded, and

core connected with the same, whereupon the A small amount of hammer is allowed to fall. powder is placed in the cylinder; the hammer falling, forces its plunger into the cylinder, compressing and heating the air, which explodes the powder, forcing the hammer up again, and forcing the cylinder downward with an effect fully eight times as great as from the fall of the weight alone. At the top of the guide frame is suspended a plunger, which fits into a cylinder in the top of the hammer, thus making an air-chamber to receive the blow of the hammer in case of an over-charge of powder, that no danger may result to the ma-

chine. I will here mention that this device is very t ful as a drop-hammer, being complete within itself and always ready for work, independent of other source of power. Also, as a forge-hammer, the continued pressure of the blow gives this hammer evident advantage over all others for large work; for it will be observed, that the pressure is continual while the hammer is moved from a state of rest through a space equal to the length of the bore of the cylinder, which, in a large hammer, is a distance of 40in., whereas, in other methods of hammering, the pressure is lost as soon as the momentum is overcome, in spattering the surfaces of a large mass of metal. From this it results that large masses are never homogeneous to their centres, and the outer shell is put under a severe crushing strain, while the inner metal is under a like tensile strain, and thus a great loss of effective resistance occurs. Wrought metal should be kneaded and worked, as dough, to bring out its highest qualities. An hydraulic press would be the most suitable appliance, but for its slowness, which involves great loss of heat before the metal is fully manipulated. It is here that gunpowder comes to our aid, giving the continued pressure of the hydraulic press combined with the rapidity of the hammer, and thus renders possible the working of iron under the hammer like putty under the The advantages of thus pressing metal are too prominent to need enumerating.

The model which was exhibited on this occasion had a ram of about 3lb. weight, and a fall of 8ft. The charge employed was half a grain of white gunpowder, made of chlorate of potash, ferrocvanide of potassium, and sugar. With a white gunpowder, made of entorate of potassium, and sugar. With a larger instrument, whose ram weighed 73lb., with a fall of 20ft., the charge was 14 grains of the same powder. A pile placed under this, and driven one-quarter inch at a stroke by the fall of the ram, without the use of powder, was driven 2in. at each stroke, when the powder was used, and after being driven, with a square end, into hard ground, to a depth of 4ft., showed no splitting

or injury to its head.

# THE BRITISH ASSOCIATION.

THE thirty-ninth meeting of the British Association for the Advancement of Science, will commence in Exeter, on Wednesday, August 18 next, under the Presidency of George G. Stokes, M.A., D.C.L. Sec. R.S., Lucasian Professor of Mathematics in the University of Cambridge. As Exeter has never yet received a visit from the Association, the following information may be useful. The population of the city is about 42,000. The hotel and lodgings accommodation in the city is quite equal to that of the majority of towns visited by the Association. Exmouth, Dawlish, and Teignmouth watering places, within about half-an-hour's journey by railway, have ample accommodation for visitors and their families. Exeter is about five hours distant from London, by the Great Western and South-Western Railways, and is on the main line of railway to North and South Devon and Cornwall. Members proposing to make a tour through Devon and Cornwall should obtain tourist tickets, which will be supplied to any one member, on production of a card of membership, from all the principal stations in England. Tourist's tickets are available for a calendar month, and for a longer period, by a small further payment. The journey can be broken at Exeter, both in going and re-turning to North or South Devon and Cornwall. Members can obtain return tickets, available from August 16 to 28, on production of their card of membership, at ordinary return ticket fares. The Local Executive Committee have issued a map of the West of England, with the objects marked thereon, which are likely to be of interest to the members of the Association. Invitations have been already received by the Local Committee from inhabitants of Plymouth, Devonport, Torquay. that the hammer should be held by a pawl, which and Taunton, for the members of the Association catches into a rack secured parallel with the guides. The pawl is released from the rack by a it is expected that excursions will be made to



North Devon, Dartmoor, and other places of scientific interest, during the meeting. The head quarters of the Association are at present in the Albert Memorial Museum, Exeter, the honorary local secretaries being Messrs. Henry S. Ellis, John C. Bowring, and R. Kirkwan.

### DETERMINATIONS OF FREE OXYGEN.

T a meeting of the Manchester Literary and A Philosophical Society, Mr. Peter Hart de-scribed his method of making rapid determinations of free oxygen. The apparatus required consists, in addition to an ordinary pneumatic trough, of two tubes, each ½in. diameter and 16in. long, closed at one end. One of the tubes is graduated into 50ths of a cubic inch, and the other is coated internally with phosphorus. This is effected by dropping into the tube a few pieces of phosphorus; it is then to be closed by a sound cork, and the phosphorus (melted by immersing the tube in hot water) may be spread in a thin coating over the interior by turning it round as it cools. On cooling, the cork is to be withdrawn, the tube filled with water, and a piece of india-rubber tube tied securely over the This completes the apparatus. The modus mouth. operandi is as follows :- Both tubes are filled with water and allowed to remain in the trough, a por-tion of the air to be examined is passed into the measuring tube, which is now allowed to remain for five minutes in the trough to allow it to attain the same temperature as the water. It is lifted until the water is at the same level within and without, and may then be closed by the finger, and withdrawn from the trough. The volume is easily noted. This done, it is connected by the india-rubber joint with the phosphorus tube, into which the air is allowed to flow. The whole may which the air is allowed to flow. The whole may now be placed for half an hour in the trough, when the gas may be poured back into the measuring tube, the level once more taken, and the volume read off in the same way as before. The loss is oxygen. In the cut, a is the measuring tube, b the india-rubber junction, and c the phosphorus tube.

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No claim is made for strict scientific accuracy in connection with this apparatus; its sole merit consists in its offering an easy and rapid means of approximately determining the free oxygen in an atmosphere. In the working of sulphuric acid chambers it has been found extremely valuable, and possibly may be found so for other technical inquiries.

THE STREET TUNNEL AT CHICAGO AND ITS MACHINERY.\*

By PROF. S. W. ROBINSON, C.E.

T the time of my visit to the Chicago Washington-street Tunnel, on the 13th inst., the work of tunnelling under the river was considerably more than half completed. The approach and arched way on one side are entirely finished as far as to the centre of the river, and work has begun briskly on the opposite bank. The bed of the river consists of soft, tough clay. It is, therefore, impracticable, if not impossible, to drive the tunnel without unroofing it, especially under the river's bed. And as it is necessary to continue the work without interrupting the river navigation, and still uncover the roof, it became necessary to establish a coffer-dam that should extend to only about half of the river's breadth at one time. By means of such a dam, the tunnel has been completed up to the centre of the river, and covered again. dam was then transferred to the opposite shore, shifting at the same time the passage for boats.

The second dam was completed on the 13th inst.,

and the water partly withdrawn with the pumps still working. Two pumps were in operation—a rotary and a vacuum pump. The latter is of new design, and deserves more particular mention. It will directly be more fully described. The work of uncovering the tunnel bed has begun on this side, just beyond the dam or river bank, and proceeded to a depth of 50ft, with about the same length and breadth. When the coffer-dam emptied, the excavation will be extended into it, and the finished part of the arching brought for-ward beyond the limits of the river and covered. The dam then can be removed from the river entirely, and the tunnel continued to its second approach.

Two power derricks are in use for hoisting and

shifting the excavated material, only a part of which is required to be taken away, viz., a volume equal to that of the tunnel, the approaches, and the masenry. The balance is to be transferred from its native bed to the top of the tunnel. In doing this, the derricks command about a cubic vard at a lift, which is raised at the rate of a foot per second, taking and depositing it at about 15ft. from the centre mast. The clay is so soft, that the sides of the excavation must be supported to protect the foundations of adjacent buildings. This is effected by means of cross timbers pressing against plank walls. The clay is handled with hay forks, it being previously cut into lumps with sharp spades. It was noticeable that the workmen were very careful to entirely free every lump, that it should not be found tied down by the tenacity of a small unsevered fragment. On the whole, the work appeared to be progressing very favourably, with a good prospect of a speedy and successful termination

The vacuum pump spoken of above, is simple, and, it is said, very efficient. It consists of a cylindrical chamber of wood, strongly hooped, being about 3 ft. in diameter, and about 5ft. in height; having suction and discharge pipes with valves properly arranged, and a steam pipe leading from a boiler; together with a small injector vessel supplied with water. Steam of the desired pressure is forced into the chamber by the steam pipe, when the admission is arrested by a three-way valve; a branch pipe leading therefrom, terminated by a check valve, allows the escape of steam from the chamber until the pressure of the atmosphere is reached. As soon as this occurs, a valve drops in the vessel upon the top of the chamber, introducing a spray jet, by which the remaining stream is condensed, thus forming the vacuum. The valve of the suction pipe is then raised, and water rushes in from below and fills the chamber. This done, steam is again forced into the same chamber in contact with the water, which promptly retires before it through the discharge pipe. The small injector vessel is filled with water from the dis-charge pipe. When the water is driven out, the three-way valve checks the steam, and the vacuum is again formed, and the above described opera-tions repeated, which may be so continued indefi-nitely. The three-way valve was operated by a person stationed for that purpose. The water was raised about 12ft., to be discharged over the dam. By a similar machine, it is said, water has been raised in a jet to a height of over 100ft.

A question is naturally raised as to whether this is an economical method of using steam. Let us consider this subject briefly. It was ascertained by actual observation with thermometers, that the water discharged over the dam by this pump, was increased in temperature two degrees. By calculation, it is determined that the condensation of the steam remaining in the chamber at atmospheric pressure, is sufficient to raise the temperature of the chamber full of water about two-thirds of a degree. There is then imparted one and one-third degree of heat to the water, by reason of the admission of steam to contact with it, and with the wet interior surface of the chamber. The prejudicial result effected by operating this contrivance is then represented by the mechanical effect equivalent to heating all the water discharged one and one-third degree. It was determined by Joule and Mayer, independently, that to raise the temperature of one pound of water one degree, requires a mechanical effect equal to raising 772lb. 1ft. The volume discharged per minute, at the rate of three strokes, is 144.3 cubic feet, or 9018.71b. To raise this 12ft. per minute, requires three and three-tenths horse power. But to heat it one and one-third degree, requires perminute a mechanical effect equal to 9018.7 × 772 × 1 = 9280244 ft. pounds = 281-horse power. But the steam was all taken from a 15 or 20-horse boiler. What, then, is the mechanical equivalent in this case?

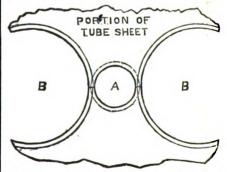
But let us take another view of the case. heat a given quantity of water one and one-third degree, takes twice as much steam as to heat it two-thirds of a degree. Then if 144.3 cubic feet of steam, at atmospheric pressure, will heat the same volume of water, at the ordinary temperature, two-thirds of a degree, twice the quantity of steam at atmospheric pressure will raise the temperature of 144.3 cubic feet of water one and onethird degree. If the last named quantity of steam, which is the amount lost by incidental condensation, be used each minute in a steam cylinder at 60lb. apparent pressure, it would perform the work of two and a-half horses. Taking this as the prejudicial work of the vacuum pump, and 3.3-horse power, which was shown above to be the theoretical work required to raise the water, we find that

the work lost is 0.76 of the useful effect; and 0.43 of the total effect; which is a large per centage for even ordinary pumps. If this is true, it appears from the results of the experiments cited, that as a device for raising water, the vacuum pump is not an economical machine, except where con-venience demands its use, or where its temporary employment justifies the application in preference to more costly machinery.

One of the most essential pre-requisites for economical results with this device, is, that the surfaces with which the steam and water have alternate contact, must be non-conductors of heat. Indeed, the measure of success depends upon the degree to which this principle attains. at first naturally suppose that the cold water surface would contribute to rapid condensation of steam. But it is very well known in the science of physics, that water is one of the poorest conductors of heat; which becomes particularly apparent in the downward direction where conviction fails to act. A remarkable statement, substantiating this fact, on a large scale, appeared in the "Scientific American," early last spring, in which it was confidently asserted that one of two boilers of moderate size, established in separate arches, connected by a steam pipe, having no separating valve, had frequently been fired while the other was not, although still containing the ordinary supply of water; and that the water in the unfired boiler had not changed materially in temperature after a considerable interval of time. From this, together with the facts relating to the vacuum pump, it appears that water is a poorer conductor of heat than the wet wood of the interior of the chamber, as the amount of condensation incident upon the ejection of water is very considerable. If so poor a conductor as wood is barely suitable for the interior of the chamber, iron could not possibly answer, notwithstanding the want of its strength to guard against explosion; although iron cylinders lined with wood or other non-conducting material, might serve the purpose well, some good non-con-ducting material having little inclination to retain water, as wet would form the best lining. That so good a conductor as iron cannot form the interior surface, is strikingly shown by the performance of certain surface condensers. In Hamilton, Ontario, at the machine works of the Northey Brothers, a 12-horse engine exhausts into a cylindrical wrought-iron chamber, about 2½ft. in diameter, and 30ft. high. It is of boiler plate, about 5-16ths of an inch thick. A stream of water delivered upon the top flows down over the whole exterior surface. chamber maintains nearly a perfect vacuum.

### THE TUBE SHEET.

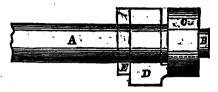
THERE is nothing, perhaps, among the duties of the steam engineer which occasions more anxiety often than leakages among the tubes in the fireplace of the boiler, especially in the locomotive boiler, caused, perhaps, by heedless firing or not unfrequently by the unskilful setting of the tubes in the first instance. The setting of tubes should never be entrusted to any but thorough and trusty workmen. The tube sheet is often strained if not cracked by the immederate driving of the "tube range" around which the tube is unset, and by too plug," around which the tube is upset, and by too hard upsetting of the end of the tube. The plug should never be driven hard enough to expand the tube hard up against the hole. It is better to do this by upsetting the tube, thus making the tube thicker and stronger at its point of juncture with the sheet. In annealing the ends of the tubes, in preparing them for setting, care should be taken not to heat them more than an inch or so, just sufficient for the upset. A light hammer should be used with the setting tool, for it is better to mass summent for the upset. A light hammer should be used with the setting tool, for it is better to pass several times around the "tube plug" with light blows, than to attempt to accomplish the same end with a few heavy blows, which may strain, and perhaps crack, the sheet between the tubes—espe-



cially when the tubes are as near together as in locomotive boilers. When the sheet cracks between locomotive boilers.

<sup>\*</sup> Journal of the Franklin Institute, January, 1869.

two adjacent tubes, it may be repaired by screwing in a fine threaded plug A, nearly large enough to fill the space between the tube holes, B. (See diagram, which represents a section of a tube sheet.) Before screwing in the plug A, the hole must be counterbored sufficient to cut into the counter-boring of the tube holes B, as shown by the dotted circle; then the plug A may be headed down with a light hammer, so as to make a steam-tight juncture with the end of the tube. The outside circle around the tube holes B shows the amount of counter-boring. The plug A must be slightly tapering, and screwed in firmly. A convenient tool for counter-boring tube holes is represented in the following diagram. tube holes is represented in the following diagram.



A the arbour, which may be made of steel about 6in. long exclusive of the shark; B the tit upon which the ring C is fitted; this ring is for a guide to fill the tube hole; D the cutter; E the wedge. There may be as many rings C as there are sizes of tube holes. The nib of the cutter must be set to agree with the ring, as shown.—"F. G. W.," in the "American Railway Times."

#### ELECTRIC FIRE SIGNALS.

PRACTICAL illustration of the value of the A PRACTICAL illustration of the value of the electric system of signalling in houses is given in the recent fire at the seat of the Duke of Northumberland, at Albury Park. There the first alarm of the fire was given by means of the electric bells and fire alarms with which the mansion has been fitted, by Mr. Sax, of No. 108, Great Russell-street, Bloomsbury, and who has patented the system. This is, we believe, the first instance in which the application the first instance in which the application of electricity, as a self-acting fire alarm, has been practically illustrated. Had it not been for this timely warning, the consequences of the fire might have been far worse than they were. We can bear testimony to the value of these signals, can bear testimony to the value of these signals, although not, we are happy to say, from actual conflagration, although, nevertheless, from fire. Our office was fitted some two years since with Mr. Sax's electric bell as a means of communication with another department. The signalling button was placed beside the fireplace, and being set very fine, a little extra firing one day started the bell, and brought our office boy up with a run. This is ample testimony of its efficiency under temperatures higher than ordinary.

## THE ARTIFICIAL PRODUCTION OF ICE AND COLD.

### BY DR. B. H. PAUL

THE application of heat for cooking food has been THE application of heat for cooking food has been considered one of the most obvious characteristics by which man is distinguished from the lower animals, and there is even still greater reason for regarding the application of this physical agency for various economic and industrial purposes, as being one of the circumstances most important in determining the difference between civilized man and savages, and most conducive in various ways to the spread of civilization.

ing the difference between civilized man and savages, and most conducive in various ways to the spread of civilization.

In most of the industrial arts, the application of heat is involved in some one or other of the operations to be performed. Through the medium of vapourized water, it is the principal means of locomotion on land and by sea, as well as the chief source of motive power; while in the extraction and working of metals, and in most productive arts, involving chemical alteration of raw materials, it is essential for bringing about the various changes to be effected. But, though chemical alteration is, in many cases, the object to be obtained in manufacturing operations, and then the application of heat is the means by which that change is facilitated, there are some cases in which it is desirable to hinder or prevent the chemical changes to which certain materials are liable even within the ordinary range of atmospheric temperatures. Thus, for instance, all articles of food, and especially those of animal origin, when kept for any length of time at the ordinary temperature, undergo a chemical change which renders them unfit for use. They pass into a state ofputrefaction or decay, and are gradually resolved, under the influence of atmospheric exygen, into the simplest forms of combination their elements are capable of assuming. For this change, a certain temperature is essential, and though it probably, cannot capable of assuming. For this change, a certain temperature is essential, and though it probably cannot

be prevented altogether, it is very considerably hindered by a reduction of temperature. Thus, for instance, in Siberia, the carcases of mammoths have instance, in Siberia, the carcases of mammoths have been found in a very perfect state of preservation, notwithstanding the vast lapse of time they have been buried in the frozen soil. In like manner, meat, and game, or fish, may be preserved for a long time, quite fresh, by keeping it at or below the temperature of freezing water. For this and other purposes which require a low temperature, and where it is desirable to abstract heat, instead of applying it to any substance, ice has been largely employed, and the importation of ice into this country from higher latitudes has become a very large trade since the vear 1840 year 1840.

year 1840.

Ice acts as a cooling agent in virtue of the physical fact, that, in common with all solid substances, it requires an expenditure of heat for its conversion into the liquid state. The heat thus applied does not fact, that, in common with all solid substances, it requires an expenditure of heat for its conversion into the liquid state. The heat thus applied does not produce any elevation of temperature, but as the ice melts it disappears, so far as the indications of the thermometer will show, and there remains a quantity of water of the same temperature as the ice itself. Thus when ice or, still better, snow, is mixed with three-fourths its weight of boiling water, the water remaining after the ice has melted, has a temperature of 32deg. Fah., the same as the ice itself; the quantity of heat in the boiling water, corresponding to the interval of temperature between 32deg. and 212deg. Fah., having been rendered latent, or expanded in effecting the liquefaction of the ice. It is in this way that ice cools water, air, or any other substance it is brought in contact with, which has a temperature higher than 32deg. Fah. Hence it will be seen that refrigeration, or the production of cold, is simply a manipulation of heat. It is an operation in this respect perfectly analogous to the production of a high temperature, in so far as both processes consist in the transfer of heat from one substance to another, and are subject to the same general laws. They are, however, reverse processes. Thus in generating steam, heat produced by the combustion of fuel is communicated to water. In making ice, on the contrary, heat is abstracted from water, and in this process, the water which is cooled corresponds to the fuel burnt in generating steam, or in converting any other substance into vapour. Just in the same way that the fuel in burning yields its heat to the substance vapourized, so does the water, in making ice, yield its heat to some other substance capable of receiving it. This is the nature of the work to be done in making ice, and it is now necessary to consider the amount of that work requiste for producing a given quantity of ice.

Water at the temperature of 60deg. Fah. contains an amount of heat greater than that contained i

Heat units. lbs.  $882,256 = 2,240 \times 170.65$ .

882,256 = 2,240 × 170.65.

This is a quantity of heat not more than about one-eightieth part of that capable of being generated by the combustion of a ton of ordinary coal. The means by which this amount of heat may be abstracted from water consist in producing some physical change involving an expenditure of heat, and doing this in such a way that the heat required for and applied to that purpose, is abstracted from the water to be cooled and frozen. The conversion of any substance into vapour is a change of this kind, which involves an expenditure of heat similar to that taking place in the melting of ice. The amounts of heat thus absorbed by various substances in vapourizing are as follows: are as follows :-

Latent heat per lb. Authority. Regnault.
Favre and Silbermann . . . 364.3 .} Andrews. Ether .

The amount of heat thus disposed of and rendered latent in the formation of steam from water is considerably greater than that existing in the latent condition in liquid water, or, what amounts to the same thing, that expended in melting ice; but the vapourization of water cannot be applied as a means of refrigeration to any great extent, because under the ordinary atmospheric pressure it does not take place readily, or with sufficient rapidity at temperatures much below the normal boiling point, or 212deg. Fah., and even when the pressure is removed by means of an air pump, the vapourization of water proceeds very slowly at low temperatures. There are, however, other substance which vapourize readily under these conditions; and, for this reason, although the amounts of heat expended and rendered latent in their vapourization are less than in the case of water. Ether, alcohol, and liquid ammonia are substances of this kind; and, according to the fore-The amount of heat thus disposed of and rendered

going data, expressing the latent heat of their vapours, the quantities of each of these substances which going data, expressing the fatent neator their vapours, the quantities of each of these substances which would have to be vapourized, in order to produce a ton of ice from water at 60deg. Fah., or to produce a refrigeration equivalent to the melting of a ton of ice, would be:—

From this comparison, it will be seen that the expenditure of heat accompanying the vapourization of liquid ammonia is much greater than it is in the case of alcohol or ether, and that in this respect it is the most powerful as a refrigerating agent. But the amount of heat rendered latent in the vapourization of any motorous is not the old rendered head. amount of heat rendered latent in the vapourization of any substance, is not the only or even the chief point which determines its efficiency of a refrigerating agent. The degree of facility with which a substance vapourizes at low temperatures is of still greater importance, as will be evident from the following table, which gives the tension of the vapours at different temperatures below the boiling points of the liquids under normal atmospheric pressure: ressure :-

Normal Boiling Point.	Ammonia.	Ether.	AlcohoL	Water.
Notate Boning Foric	28deg.	95deg.	172deg.	212deg. F.
deg. Fah. 104 63 50 pour in inches of mercury at -4 -109	inches. 463-64 254-61 181-58 124-52 55-03 20 81 9-45	inches. 35:81 17:06 11:28 7:23 2:66	inches. 5-26 1-75 -96 -50 -13	inches. 2·16 -68 -36. -18

Since the tension of a vapour at any temperature is the measure of the facility with which the liquid is the measure of the facility with which the liquid evaporates at that temperature, it will be seen from the data in this table, that, in this respect, there is a very considerable difference between the liquids there named. Here, again, the characters of liquid ammonia are such as to give it a marked precedence over all the other liquids, as a refrigerating agent, by reason of its relative capability of vapourizing at very low temperatures. This substance is, in fact, gaseous under normal pressure, within the ordinary range of atmospheric temperature, the boiling of the liquid being many degrees below the zero of Fahren-eit's scale: and at ordinary temperatures it requires heit's scale; and at ordinary temperatures, it requires a pressure of from eight to ten atmospheres—117 to 150lb. per square inch—to maintain it in the liquid

Alcohol, although it has a greater capability than ether of absorbing heat in vapourizing, is still inferior to ether as a refrigerating agent, on account inferior to ether as a refrigerating agent, on account of its being much less readily vapourized at low temperatures; and even ether evaporates so slowly at temperatures much below its normal boiling point, that it can be used for refrigerating only with the aid of an air pump to maintain the requisite rate of vapourization. Liquid ammonia is, therefore, by far the most efficient material to use for this purpose, not only on account of its ready vapourization at low temperatures, but also, because its power of absorbing heat in that change is but little inferior to that of water.

ing heat in that change is but httle interior to that or water.

Another process, in which heat is expended and rendered latent, is the expansion of air. The amount of heat thus absorbed is at the rate of -069, or about 1-14th of a heat unit for each pound of air expanded to the extent of -002035, or about 1-490th of its volume at 32deg. Fah. under normal pressure. If, therefore, air be compressed, say, to one-tenth of its bulk, and, after being cooled to a low temperature, it be allowed to expand in such a way as to perform mechanical work, such as moving a piston, there is an expenditure of heat proportional to the resistance overcome and to the degree of expansion. Consequently, the temperature of the gas is reduced during the act of expansion, and this effect may be taken advantage of for purposes of refrigeration. The chief disadvantage of this method consists in the great expenditure of power requisite for compressing the air, which involves a large consumption of fuel.

(To be continued.)

### RANGE EXPERIMENTS FOR FIELD ARTIL-LERY AT SHOEBURYNESS.

LERY AT SHOEBURYNESS.

SOME time since, we ("Standard") recorded the first trial of an interesting system for ascertaining the distances of objects in the field by instrumental means, devised by Lieutenant Nolan, R.A., as against the ordinary system in the service, of judging the distances by eye alone. Since then, other instrumental means have been proposed by other officers and by opticians; and on Wednesday week a competitive trial between several of such instruments, designed to ascertain rapidly distances for artillery purposes, was made at Shoeburyness, under the direction and in the presence of the Commandant Colonel Elwin, R.A. Four telemeters, constructed upon different principles, were employed. The first, made by Mr. Elliot, is a telescope containing micrometer cross wires; one of these is



<sup>\*</sup> Reproduced by permission of the publishers from the Quarterly Journal of Science."

<sup>\*</sup>The unit of heat here referred to is the quantity of heat required to raise the temperature of a pound of water from 40deg, to 41deg, Fah. or one degree of tem-

fixed, the other movable. The man whose distance is desired being brought within the field of the telescope, the fixed wire is seen in line with his feet, telescope, the fixed wire is seen in line with his feet, and the movable wire is made to appear to touch his head: this latter movement is effected by a ring round the small end of the telescope, which is graduated in yards, so that as soon as the wires are properly adjusted the range may be read off at once. Another scale gives the distance of a horseman. The second system is that of Colonel Clerk, R.A. It may be said to consist of two very powerful and much simplified sextants, which are worked at each end of a base of 100 yards. The mean of the angles which they give being ascertained, a table shows the distance.

which they give being ascertained, a table shows the distance.

The third instrument has been invented by Mr. Adie, and has already been used by surveyors and sportsmen. A metal case, one yard long, contains two telescopes, of which the object glasses are at the extremities, and their common eye-piece in the centre; two pairs of prisms bend the rays of light, so that from the two ends they reach this common eye-piece, which has one of its glasses cut in halves. When the two telescopes have been made by a small handle to converge on any object, a single image is seen in the eye-piece; when they do not so converge a double image is discerned. A scale divided very finely to two seconds shows how much the handle has moved the interior of one of the telescopes; and finely to two seconds shows how much the handle has moved the interior of one of the telescopes; and corresponding to the small angles read off on this scale are the distances shown on an ivory tablet affixed to the instrument. Lieutenant Nolan employs two guns, on which are affixed cross telescopes; the distance between the guns was for the first five cases 57, and for the remainder 93 yards. By a system of mechanical calculation, or modification of sliding rule, he combines the base and base angles so as to give the range.

To test these various instruments a mounted sergeant was sent along one of the lines of pegs which mark the distances from the several batteries at Shoeburyness, and whenever he halted his dis-

which mark the distances from the several batteries at Shoeburyness, and whenever he halted his distance was estimated by the different systems, the answers being given to Captain Alderson, R.A., Assistant Superintendent of Experiments, and afterwards compared with the true position of the sergeant. Mr. Adie manipulated his own telemeter, Lieut. Ellis, R.A., that Mr. Elliot; Mr. Butters, of the Royal Carriage Department, Woolwich, Colonel Clerk's; and a party of gunners, under the superintendence of Lieutenant Nolan, that of the latter gentleman. The results are given below:—

True Distance.	Errors.									
Yards. 865 1,200 1,619 1,900 2,558 2,706 3,452 8,380 8,802 8,040 2,717 2,854 1,975 1,640 1,205	Adie. Yards. 71 0 19 12 156 244 231 147 164 93 133 154 95 80 81	Clork. Yards. 6 19 35 48 104 107 300 217 115 160 160 84 40 29	Elliot. Yards. 15 10 149 190 158 6 352 480 1,002 240 517 154 95 120 25 16	Nolan. Yards. 2 4 15 6 24 8 22 26 8 4 17 7 25 9 19						

# Acgal Intelligence.

COURT OF CHANCERY. May 25.

(Before the LORD CHANCELLOR.

IN RE BATES AND REDGRAVE'S PATENT.

was a question with respect to a patent which had been filed under a provisional specifica-tion. It seemed that a second inventor had since lodged a provisional specification for the same subject matter, and had procured its being first sealed. It was submitted by the petitioner that the filing of the provisional specification in this case ought

to have secured the rejection of the second patent.
Mr. T. Webster, Q.C., Mr. Grove, Q.C., Mr. Everitt,
and Mr. Aston appeared.
The Lord Chancellor said that with regard to
the interpretation of the statute, which provided
the machinery of provisional specifications, he was
of opinion that an inventor who had filed a provisional specification after another person had filed
one on the same subject, but who had contrived to
have his patent first scaled, was in the same section have his patent first sealed, was in the same position as he would have been before the passing of the Act.

The benefit conferred by the statute on inventors from a provisional specification, was protection against the consequence of imprudence on their

own part, or of a betrayal of confidence on the part of their working or others. Now, complete protection might have been obtained by filing a complete specification, under section 9, but that had not been done by the petitioner. An inventor who had filed a provisional specification could not be compelled to proceed with his invention, and, therefore, if the Atternet Characteristics of the compelled to proceed with his invention, and, therefore, if the Attorney-General rejected a second applica tion, in consequence of a provisional specification having been already filed, the public might be deprived for years of the benefits resulting from the ingenuity of many minds working together in the same direction. The petitioner could not be protected from the consequences of his own omission. Under the circumstances, however, the Court would not give costs.

#### TO CORRESPONDENTS

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 1s. 8d. yearly, or 10s. 10d. half-yearly payable in

advance.
All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANIC, "MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday exeming.

ments should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.

Advertisements are inserted in the MECHANIOS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 18 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

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# Meetings for the Aeek.

Mon.—Royal United Service Institution.—Lieut. Herbert Jerkyll, R.E., on "The Destruction of Wrecks under Water by Means of Explosive Compounds," at 8.30 p.m.

TUES.—Royal Institution.—Professor Grant on "Stellar Astronomy," at 3 p.m.

WED.—Civil and Mechanical Engineers' Society.—Mr. Arthur C. Pain on "The Building Stones in Use In and Around London," at 3 p.m.

THUES.—Royal Institution.—Professor Tyndail on "Light," at 3 p.m.

THURS.—Royal Institution.—Professor Tyndall on "Lingue, at 3 p.m.

Fr. Royal Institution.—Professor Odling on "The Simplest Organic Compounds," at 8 p.m.

Royal United Service Institution.—Mr. H. Baden Pritchard, Chemical Department, Royal Arsenal, Woolwich, on "The Application of Photography to Military Purposes," at 3 p.m.

SAT.—Royal Institution.—Mr. Deutsch on "Semitic Culture," at 3 p.m.

London Association of Foremen Engineers.—Mr. David Walker on "The Simplification of the Patent Laws," at 8 p.m.

# Correspondence.

APPLICATION OF LIQUID FUEL TO METALLURGY.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,-My attention has been called to a leading SIR,—My attention has been called to a leading article in the issue of your valuable periodical for the 14th instant, on the "Application of Liquid Fuel to Metallurgy." I concur most fully in all that is there stated, respecting the benefits derived from the use of this fuel for metallurgic and steam purposes, and its great superiority over coal. In addition to a vast economy of time, labour, space, and first cost of material, as well as a superior article of manufacture, as rightly claimed in the above article, there are still other uses and purposes to which it is about to be as rightly claimed in the above article, there are suit other uses and purposes to which it is about to be applied, not inferior in importance to the foregoing. Seven years' continuous experience in the different methods of using liquid fuel, in the United States, in methods of using liquid fuel, in the United States, in search after the best means of utilizing the same, enable me to speak with considerable confidence on the subject. Having regard to the truth of what may become history, and while bearing the strongest testimony to the general correctness of the article alluded to, I am, nevertheless, compelled to take exception, when you add at its close, that "it was he (Mr. Dorsett) who first demonstrated the practicability of running a vessel of 500 tons burthen, by means of liquid fuel, and it was he who has now succeeded in advancing the science of metallurgy, &c."

Both these assertions are quite incorrect, as I will now prove to you. Locomotives were run by me upon a railroad in the United States, in 1863, and are to-day working there upon liquid fuel alone. For four years past, numerous oil wells in Pennsylvania have been pumped by steam power produced by my

system of liquid fuel. In the spring and summer of 1868, the "Island City," a Olyde-built side-wheel steamer of some 800 tons was in use in Boston Harbour, working on this new fuel; and you may remember the fact, that the importance or novelty of the event induced the President of the United States, while on a visit to that city, to make an excursion trip in her, down the Bay, in order to witness the working of this new steamfuel, of which he expressed a very high appreciation. Respecting its application to metallurgy, as early as the fall and winter of 1867, I was engaged in the city of New York in manufacfacturing wrought-iron blooms, weighing from 100 to 300lb., for boiler plate. This is surely a more severe test than merely heating those plates for bending. These solid blooms were quickly brought to a welding heat, and then worked under a 10-ton steam hammer, entirely by the agency of liquid fuel. I had previously patented and now use a new form of furnace and firebox, equally adapted to liquid and solid fuels. These systems are at the present time in operation in France, making steel and malleable iron, samples of which are now before me.

It is not my purpose at this time to advocate this or condemn that method of utilizing liquid fuel. I may be permitted, however, to remark, that during the many years I have been occupied with this subject, I have designed and secured patents upon several contrivances for the above purpose; at the same time, have tested and exploded many others, some for burning the liquid direct—others, first vapourizing then using it in jets, as practised by Mr. Dorsett. I now hold a patent for this system, granted in the United States, in the year 1863, reported in England and France some three years later, with slight modifications. In the first-named country, this vapourizing method of burning liquid fuel has been subjected to a most exhaustive trial, but, in the long run, it proved an entire failure. Besides, it is found quite dangerous, inasmuch, as by this process, there must be

267, Rue St. Honore, Paris, May 20.

[We are obliged to our correspondent for calling our attention to an omission in our article—that of the words "in England," after giving Mr. Dorsett credit for what he has done. We were aware that liquid fuel had been tried in more than one instance on large vessels in the States, but on a different principle. Our correspondent's remarks upon the result of the application of liquid fuel to the manufacture of boiler plates are a practical comment upon our observation, that we may "expect further and even more important improvements in the application of the system." With regard to the burning of the fuel either directly as an oil, or indirectly as a vapour, we, like our correspondent, do not propose here to discuss the relative merits of the two principles. They are well known. We would only observe that the Dorsett process has accomplished in England what no other process has. Whether other systems could give such results, is open to proof by their respective inventors.—Ed. M. M.]

# THE SMOKE NUISANCE.

"The Smoke Nuisance and its Remedy," you ask, "What about the noxious gases from the sewer, Mr. Richardson." Permit me in reply to say that my soot and water flue is provided with a drain eye entrance to the sewer, similar to common drains. The flap or door of the drain eye and younge to allow a flush of water. the sewer, similar to common drains. The flap or door of the drain eye only opens to allow a flush of water and soot to pass through and then closes; any ascent of odour from the sewer is, therefore, impossible. But supposing it was possible, would not the soot and water neutralize any rising odour? I consider the passing the soot of London into the sewers would not only deodorise them, but it would render the sewage of greater value as manure, and render unnecessary the troublesome process proposed of mixing it with common dry earth previous to its removal for use. The passage of a great quantity of water through the sewer might oblige us to provide outlets for its escape, but this could easily be done, and the water filtered through charcoal before it flowed away.—I am, Sir, yours, &c.,



FIFTEEN steamer gunboats are now being built for the Spanish Government in the Mystic navy yards of Connecticut. The gunboats are to be each 107ft. long, and measure 140 tons. Five navy yards, each employing 100 men, will be required to complete the contract. The machinery will be constructed in New York City. structed in New York City.

INTELLIGENCE is received from San Francisco of INTELLIGENCE IS received from San Francisco of the inauguration of the overland trade with China and Japan on the 9th inst. At that time the first invoice of tea from China to St. Louis was shipped by the Pacific road. The overland mails have been delivered at Promontory Point to the Central Pacific road, and the through line has been regularly established. blished.

According to the "Bureau Veritas" of Paris the ACCORDING to the "Bureau Veritas" of Paris the number of vessels reported as totally lost during the month of April last was 165, of which 71 were British. 27 American, 16 French, 11 North German, 5 Spanish, 5 Dutch, 5 Norwegian, and 25 of various other nationalities. This report contrasts favourably with those of the corresponding month of the three previous years, in which the losses were 189 in 1866, 265 in 1867, and 202 in 1868.

THE Board of Trade have awarded a binocular glass to Captain Mignot, of the French vessel "Arabie," of Nantes, for having rescued, on January 31, in long. 11-54 W. and lat. 47-39 N., Annana Howzy or Hoaze, one of the crew of the ship "Windsor Castle," of Liverpood, which vessel is supposed to have foundered at sea. The Board have greated for each to the four property. have also awarded £2 each to the four men who manued the "Arabie's" boat, and were instrumental in rescuing Hoaze.

Two 100-pounder steel muzzle-loading guns and two foo-pounder steel muzzie-toading guns and two 6-pounder breech-loading steel guns, manufac-tured by Messrs. J. Vavasseur and Co., of the Lon-don Ordnance Works, Southwark, were success-fully proved yesterday week at the proof butt, Royal Arsenal, Woolwich, with the ordinary proof charges, Major-Gen. C. H. Burnaby, Royal Artillery, being present on the part of the firm. These guns are intended to form part of the armament which will be supplied to the Japanese corvette "Iho-Iho-Maree," now building at Abordon. now building at Aberdeen.

A MOST gratifying circumstance connected with the Marine Society's training ship "Warspite" occurred during the Whitsuntide holidays. Ninetysix boys were granted leave of absence from Saturday last until the following Tuesday at four p.m., and at the prescribed hour the whole party, with one exception, returned to their ship at Woolwich. The system of training which could ensure such a result must be good; and these lads, when they eventually join the Royal Navy or merchant service, will not easily lose the habits of order and discipline learnt on board the "Warspite."

WE have to announce the death of Admiral Francis Decimus Hastings, who expired at his residence, Barbourne, near Worcester, on the 21st inst., dence, Barbourne, near Worcester, on the 21st inst., after a comparatively short illness. Admiral Hastings, who was a son of the late Rev. Jas. Hastings, rector of Martley, entered the service at an early age. He was commander of H.M.S. "Edinburgh" during the Syrian war in 1844, where he behaved with great gallantry. He was wounded by the bursting of a shell during the memorable attack upon and capture of Acre by the British squadron in 1840. For several years the deceased gentleman had been on the retired list.

GENERAL TODLEBEN, says the "Wiest," of St. Petersburg, has prepared a plan for converting Kieff into a strong fortress capable of holding from 50,000 to 60,000 men. This plan has been approved by the Government, and steps are now being taken for carrying it out. The General states in his report that the fortifications of that town are at present so weak that a hostile corps from Galicia or the Black Sea could penetrate without difficulty into the heart of the empire before a sufficient army could be placed so as to prevent its further progress. He therefore considers it absolutely necessary to make so important a strategical point as Kieff a strong garrison fortress.

CAPTAIN DAVID ROBERTSON, R.N., the Assistant Inspector of Lifeboats to the National Lifeboat In-Inspector of Lifeboats to the National Lifeboat In-stitution, has during the past two months been engaged inspecting the twenty-eight lifeboats of the Society on the Irish coast. Without a single excep-tion, he found the boats in admirable order, the crews tion, he found the boats in admirable order, the crews expressing the utmost confidence in them, and the local committees manifesting everywhere considerable zeal in the management of the lifeboat stations. It may be stated that the Institution has expended upwards of £15,000 on these twenty-eight lifeboat establishments, and that the support of the Irish boats involves an annual expenditure of about £1,400, which is partly met by the parent Society in London, and partly by local subscriptions.

and lengthened examination at the hands of Sir and lengthened examination at the hands of Sir Thomas Maclear and Mr. Tracy, the sailing master of the "Racoon." Their report is most favourable, and Mr. Davies is on his way to submit his invon-tion to competent authorities in England. He is backed by a recommendation from his Excellency Sir P. Wodchouse, who has taken a warm interest in the matter.

THE most destructive steamboat fire that ever occurred in Cincinnati, raged on the morning of May 12 at the landings of the New Orleans and Memphis packet companies. The fire broke out in the steamer "Clifton," and extended to the "Westmoreland," "Melnotte," and "Mary Erwin" above and to the "Cheyenne" and "Darling" below. and to the "Cheyenne" and "Darling" below.
The six boats were soon enveloped in flames. The
hulls of the "Melnotte" and "Darling" may be
used again; the others are a total loss. The fire
originated in the chambermaid's room on the "Cliforiginated in the chambermand s room on the "Churteen ton" by the upsetting of a coal oil lamp. Fourteen kegs of gunpowder on the "Cheyenne" exploded ane scattered the flames to the "Westmoreland." There were 200 barrels of coal oil on the "Cheyenne" and 25 barrels on the "Westmoreland." The loss and 25 barrels on the Westmore and. The loss of eight was 100,000 dols., which is nearly all insured The total loss is 235,000 dols.

# Miscellanea.

Gorn has been found in New Hampshire, but the report adds that the quartz when ground up is found to be a most valuable manure, and worth more for this purpose than the gold found in it.

A REQUEST has been presented by the ladios of St-Petersburgh to the authorities, soliciting permis-sion to found an establishment for the publication of literary works written by women.

It has been observed by several French botanists that all the large healthy trees of the woods of Ville d'Avray and St. Cloud are, in the immense majority of cases, thicker in the direction from east to west than in the contrary one.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending May 22, was 11,068. Total number since the opening of the Museum, free daily (May 12, 1858). 1,574,938.

A RETURN to an order of the House of Commons respecting the Bank of England was published on Tuesday morning. The parishes in which the Bank of England stands are St. Bartholomew, Exchange; St. Christopher-le Stocks; St. Margaret, Lothbury. The Bank and its premises are assessed to the poorrate at £37,540. The quantity of gold in its vaults on January 1, 1869, uncoined, was £8,760,397 7s. 5d.

THE cost of conveyance of the mails in the United Kingdom in the present year is estimated at £755,772 —£539,142 in England and Wales, £101,489 in Scotland, £115,141 in Ireland. The amount is rather less than it was last year, though the number of letters and papers carried is ever increasing. The payment onveyance of the mails by railway is estimated 412,592 in England and Wales, £80,499 in Scotland, £90.867 in Ireland.

An extra show of the Royal Horticultural Society. chiefly for pelargoniums, took place at South Kensington on Saturday last. The flowers staged were remarkably fine and well bloomed, and most of the remarkatory me and war broomed, and most of the prize specimens were magnificent. Amongst those who obtained the principal prizes for roses were Mr. Charles Turner, of Slough, and Messrs. Vaid and Co., of Cheshunt; for azaleas, Messrs. Veitch and Co.; and for orchidaceous plants, Mr. Williams, of Holloway.

THE number of visitors to the South Kensington Museum during the week ending May 22, 1869, (Whitsun Week) was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 28,811; Meyrick and other galleries, 6,127; on Wednesday, Thursday, and Friday (free) from 10 a.m. till 6 p.m., 4,517; Meyrick and other galleries, 1,413; total, 40,868. Average of corresponding week in former years, 21,709. Total from opening of Museum, 8465,204 years, 21, 8,465,204.

WA VOTE of £2.800 on account of the Wellington Monument is to be proposed to the House of Commons this Session. The original estimate for the monument was £14,000; £10,266 had been expended upon it up to the end of 1868, leaving £3,734 to be still voted. A vote will also be proposed of £667 towards the erection of a monument in Westminster Abbey to the memory of Lord Palmerston. The estimate for this monument is £2,000. £1,333 had been expended up to the end of 1868; the present vote, therefore, will complete the estimated amount.

MISS ALEXANDRE TINNE, the Dutch lady who WE last week referred to the circumstance that a gentleman at the Cape had invented an instrument explorer, has, according to letters received at Malta for ascertaining with accuracy the variations of the compass from local attraction or other causes, which are so puzzling and sometimes dangerous to navigators. The inventor is a Mr. J. H. Davis, of Colesberg, and his invention has undergone a most severe imported into Barbary a velocipede of the latest

Parisian manufacture; but finding it not adapted for the sands of the Great Desert, she presented it to the Pasha of Tripola.

A CONFERENCE of gentlemen interested in promoting the use of velocipedes was held on Tuesday afternoon, at the Inns of Court Hotel, Holborn. Mr. Alfred de Lavigerie was in the chair. The immediate object of the meeting was to consider the advisability of promoting the form ation of a velocity of the state of the chair of the cha nede and loco-machine institute. The objects of the pede and loco-machine institute. The objects of the institute would be to give prizes for the best velocipedes or carriages for public roads having any motive power except horses, and to in vestigate inventions or suggestions made in order to apply the velocipede to useful practical purposes.

The last of the race which died with him, Billy Lanny, known as "King Billy," the last of the aboriginal natives of Tasmania, has died at Hobart Town. For a long time, he has followed the life of a whaler, and was very popular among the seamen as a good-natured jolly fellow, and an amusing companion. He was not praticularly proud of his anesstry. a good-natured jolly fellow, and an amusing compa-nion. He was not particularly proud of his ancestry, and when his portrait was taken by Mr. Woolley, in 1866, for the Intercolonial Exhibition, he objected to the photographas being too black for him." He was, however, a pure bred Tasmanian aboriginal, and as black as a sloe. He was on the regatta ground in January, 1868, when the Duke of Edinburgh patro-nized that festival, and, attired in a blue suit, with a cold lace hand round his cap, he was presented to the gold lace band round his cap, he was presented to the

THE distilling industry in Holland formerly so flourishing, suffered a good deal from the civil war in America. The annual exports of hollands, called schiedam varies from 70,000 to 80,000 hectolitres. schiedam, varies from 70,000 to 80,000 hectoutres. The principal distilleries of Geneva are situate in the province of South Holland, were they are 328, employing about 2,000 workmen. The town of Schiedam alone has 226, with 600 to 800 workmen. Those employ steam power. The towns of Delit, Gondo, Rotterdam, and Lingden have also distilleries, but of less importance. At Delitshaven, near Enterbut of less importance. At Delftshaven, near Rotter-dam, there are 36 distilleries, which ship 26,400 hectolitres. The 25 distilleries of liqueurs in Amsterdam produce annually 14 million litres. In all the other provinces there are small distilleries to supply the local wants. There are besides, at Nimeguen, and at Voorburg, near the Hague, two perfume distilleries.

THERE was lately brought to M. Gosselin, at the THERE was lately brought to M. Gosselin, at the Hopital de la Charite, an infant five weeks old bearing at the end of the trunk an appendix five centimetres long, a little thicker than a goose-quill, and slightly tapering at the free end. The "British Medical Journal" states that on examination, M. Gosselin found it to be soft, and apparently not a prolongation of the vertebral column. He therefore, in compliance with the desire of the parents, removed it by two semielliptical incisions at the base. A rather large artery required ligature; the edges of rather large artery required ligature; the edges of the wound were brought together with metallic sutures; and healing, M. Gosselin has been in-formed, took place rapidly. On examination, the appendix was found to consist externally of a thin cutaneous sheath without heir and integrally on cutaneous sheath without hair, and internally an abundant fibro-cellular tissue, containing fat only at its junction with the subcutaneous connective tissue. The case was like one of "Molluscum pendulum," having the peculiarities of being congenital, of being more elongated than usual, and of being in a situation where it might readily be mistaken for a tail.

# Patents for Inbentions.

## ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronologic al order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these sbridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

ment:—
BOILERS AND FURNACES—3418, 3426, 3438, 3461
BUILDINGS AND BUILDING MATERIALS—3401, 3437, 3444
CHEMISTRY AND PHOTOGRAPHY—3390, 3393, 3412, 3459
CULTIVATION OF THE SOIL, including agricultural implements and machines.—3397, 3425, 3431, 3458
ELECTRICAL APPARATUS—3462
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c.—3398, 3405, 3417, 3432, 3435, 3447, 3448, 3452
FOOD AND REVERACE Including Abs.

FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—3388, 3414
FURNITURE AND APPAREL, including household utensils time-keepers, jewellery, musical instruments. &c.—3391, 3394, 3395, 3415, 3424, 3427, 3434, 3436, 3440, 3445
GENERAL MACHINERY—3387, 3399, 2403, 2409, 3420, 3421, 3439, 3456, 3460, 3463
LIGHTING, HEATING, AND VENTILATING—3392, 3343, 3441
3444

MISCELLANEOUS—3386, 3388, 3416, 3429, 3430, 3443, 3452, 3451, 3457, 3464

BOADS AND VEHICLES, including railway plant and carriages, addlery, and harness, &c.—3410, 3428, 3442, 3450, 3451

SHIPS AND BOATS, including their fittings-3341, 8455, 3465

STEAM ENGINES-3421, 3422 WARFARE-3408, 3433, 3435

3386 SIR J. MACNEILL, Knight, Kensington. Damping postage stamps. Dated November 7, 1868.

This relates first to the construction of portable cases or holders, corresponding in size with the postage or other adhesive stamps they are intended to hold, the depth of such cases depending on the number of stamps they are to contain.—Patent completed.

to contain.—Patent completed.

3:387 J. H. JOHNSON, Lincoln's Inn. Screw threads. (A communication). Dated November 7, 1868.

The feature of novelty is the employment of a travelling inclined plane, the angle of the incline being adjustable by means of a screw and adjusting nut, for the purpose of imparting the necessary longitudinal traverse to the screw blank or to the cutter, such travelling incline being moved forward in a guide, by means of a pinion in gear with a rack on the slide which carries the incline. This actuating pinion derives its motion from the mechanism which rotates the screw blank or cutter, as the case may be, so that the rate of motion of the incline along its guide is always in proportion to the speed of rotation of the screw blank or of the cutter, and hence a spiral or screw thread will be produced upon the blank.—Patent completed.

3388 J. STURROCK, Glasgow. Metallite caps. Dated No

3388 J. STURROCK, Glasgow. Metallic caps. Dated No.

3388 J. STURROCK, Glasgow. Metallic caps. Dated November 7, 1868.

This relates to an improved metallic caps to be applied to bottles or other vessels for the purpose of sprinkling in small quantities the liquids or fluids contained therein. The lower part of the cap is formed of thin flexible metal, for the purpose of being fitted to the neck of the bottle or other vessel; the ordinary cork or stopper is dispensed with, and a small ring of cork or other suitable material is placed between the mouth of the bottle or vessel and the upper interior part of the cap, for the purpose of forming a secure joint at this point. At the centre of the upper part of the cap a projection is formed, over which is screwed a secondary removable cap; the projection is perforated with one or more holes, through which the liquid is sprinkled as required.—Patent completed.

3389 A. M. CLARK, Chancery-lane. Planing metals, &c.

3389 A. M. CLARK, Chancery-lane. Planing metals, &c. (A communication). Dated November 7, 1868.

The invencer employs such new combination of parts, that the flywheel used in such machine may be dispensed with, substituting in lieu thereof a progressive diminution of the speed of the tool while traversing the space assigned it in the machine.—Patent completed.

assigned it in the machine.—Patent completed.

3390 A. M. Clark, Chancery-lane. Separating solid
matters. (A communication). Dated November 7, 1868.

The inventor subjects the liquid to a filtering process in
a closed vessel, under the pressure of a column of liquid
varying in height according to circumstances. A series of
apparatus is employed arranged with a view to multiply
the filtering surfaces. The filters are made movable, so as
to enable them to be readily replaced after each cleansing
of the apparatus, and permit of the operation being carried
on almost without interruption.—Patent completed.

3391 W. J. Chunke True. Washing lines. Dated No.

3391 W. J. CRIDDLE, Truro. Washing linen. Dated No. vember 7, 1869.

In the copper or other capacity in which the linen is boiled a perforated false bottom is placed, provided with a central vertical tube of suitable size, communicating with the space below the false bottom.—Patent abandoned.

3392 W. CORELESS, Datchet. Lamp globes and glasses.

Dated November 7, 1868.

The object is to so construct lamp globes and glasses as to concentrate the light from a burner all around, below the level of the light, whilst at the same time the direct passage of heat is arrested; also to afford facilities for making the light of any agreeable colour; and also to render the air of a room more agreeable by the evaporation of water. For this purpose the inventor employs a double cup-like glass, with a space between the two cups, which he fills with water. The outer cup is approximately a portion of a sphere, and the inner cup may also be of a similar form, or in some cases he makes it simply cone or funnel shaped. The inner cup is, by preference, composed of a series of plain or slightly concave surfaces rounded at the angles. The water filled into the space between the two cups prevents the transmission of heat downwards, and become slightly heated and slowly evaporates, thereby moistening the air, which in brightly lighted rooms is frequently unpleasantly dry.—Patent completed.

3393 G. T. BOUSFIELD, Brixon. Cooling and barriag soap.

3393 G. T. BOUSFIELD, Brixton. Cooling and barring soap.

A communication). Dated November 7, 1868.

This consists in introducing soap while in the hot and fluid state into metallic tubes, of the size and shape required for bars of soap, allowing it to congeal, and subsequently forcing out the soap in the form of a long bar, to be cut in lengths that may be required.—Patent aban-

to be cut in lengths that may be required.—Patent abandoned.

3334 N. WILSON, High Holborn. Sewing machines. Dated November 9, 1868.

This relates to that class of sewing machines known under the name of shuttle machines, or in any machines wherein an equivalent for a shuttle is used, such as a bobbin or reel shuttle, and consists in improvements upon a previous patent, dated February 14, 1868, in order to obtain a motion from the pinion shaft, to drive the lever, which drives the needle slide, the whole being a combination and new arrangement of parts. The arm which projects carries the needle slide. The driving wheel revolves on a stud, and is furnished with internal teeth in a recess, which drive the pinion which drives the shaft, to which is affixed the crank plate, into which is affixed to the bell crank. This bell crank reciprocates and moves on a centre pin; on the other limb of the bell crank is a hinge joint, on which hinges the reciprocating arm of the shuttle holder; carrying the shuttle. In front of the shuttle holder, carrying, fastened at the top end by a screw, and at the bottom end pressing against the arm of the bell crank, which forms the jaws of the hinge in which the shuttle holder works. When it is required to take out

the shuttle, the shuttle holder is brought over, when the shuttle can be taken out and replaced much easier than drawing out the shuttle in the ordinary way from the shuttle holder.—Patent completed.

3395 H. DAVIES and J. PARSONS, Birmingham. Cigar

3395 H. DAVISS and J. PARSONS, Birmingham. Cigar racks. Dated November 2, 1868.

The inventors mount the tobacco dish upon a central rod or pedestal, and support it upon a base plate or foot, as large as or a little larger than the dish. They prefer to make the base plate or foot of a concave figure. The base plate or foot is thereby made to constitute a shallow dish for receiving the cigar or tobacco ash. They provide the tobacco dish described with an overhanging rim, situated at right angles to the axis of the dish, and convert the said rim into a rack for receiving cigars and spills.—Patent abandoned.

3397 R. M'HARELY, Edinburgh. Hocing land. Dated November 9, 1863.

This consists of a shaft or bar, mounted on a pair of wheels at one end, whilst at the other end a handle is placed, by which the operator actuates the implement. At a short distance from the part to which the wheels are attached an adjustable guide socket is placed, in which is held the hocing tool, which is arranged to be capable of adjustment in any required position, according to the nature of the work to be done.—Patent abandoned.

3398 B. HUNT, Lincoln's Inn. New fabric. (A communication). Dated November 9, 1868.

This consists, principally, in the novel combination of a woven fabric, in which the warp threads are of any ordinary fibrous material or metallic threads, and the weft of fibres of the aloe, more commonly called manilla or vegetable silk.—Patent abandoned.

vegetable silk.—Patent abandoned.

3399 W. M. Brown, Paris. Man engines. (A communication.) Dated November 9, 1868.

The object is to utilize the man engine ordinarily employed in lifting the miners as a means of lifting the water of the mine during the time the man engine is otherwise unemployed. For this purpose to each shaft of the lifts of the man engine is attached a series of tipping buckets, which, alternately with each stroke of the lifts, are emptied and filled into each other, thus with every stroke of the one lifting all the water in the buckets of one stage, and discharging their contents into the buckets of the other lift when at its lowest point of stroke, and with each stroke discharging one bucket of water at the day level or ground level of the mine.—Patent completed. completed.

3400 P. E. DE WISSOCQ, Paris. Lead ores. Dated November 9, 1869.

This consists, first, in converting lead ores into chloride by treating them with hydrochloric acid. Second, in dissolving the chloride in water and allowing it to remain in contact with wrought or cast iron, or, better still, upon iron sponge, which decomposes it, precipitating the lead in a metallic state, and forming chloride of lead. Third, in collecting the precipitated lead and melting it in a furnace or in a pot, and then casting it into pigs. Fourth, in collecting the two secondary products which are formed, and which are sulphuretted hydrogen and chloride of iron. Fifth, when the mineral contains silver, in treating with a boiling and concentrated solution of salt the insoluble residue which is left after all the chloride of lead has been dissolved. Sixth, in precipitating by copper the chloride of silver dissolved in the preceding operation. Seventh, in employing either hyposulphite of sods or any other body having the property of dissolving chloride of silver, in place of see salt, for dissolving the chloride of silver, in place of see salt, for dissolving the chloride of silver.—Patent completed.

3401 W. R. Lake, Chancery-lane. Door handle. (A

silver.—Patent completed.

3401 W. R. LAKE, Chancery-lane. Door handle. (A communication.) Dated November 9, 1868.

This consists, chiefly, in the employment of a spring setting into a ratchet cut on the knob spindle. This spring is fitted in a chamber formed in the spindle sperture of the knob or handle, and ratchet teeth are formed on one side of the spindle, at one or both ends, a longitudinal aperture being formed or left at that part of the spindle in which the said teeth are cut in order to permit of the spring being forced out of the teeth when the handle or knob is required to be placed nearer the end or withdrawn from the spindle, and near the working or loose end of the spring, to permit of the insertion of a bradawl, or other simple instrument that will pass through the aperture or slot, and press against the said loose end of the spring, in order to force the latter from the teeth, and thereby relax the said knob.—Patent completed.

3403 H. L. BENNISON, Greenwich. Rotary engine. Dated

3403 H. L. BENNISON, Greenwich. Rotary engine. Dated

3403 H. L. BENNISON, Greenwich. Rotary engine. Dated November 10, 1868.

This consists in constructing the engine with a four-way cock, for working supply and exhaust or waste, and in the special construction of the cock, by so altering the form of the section of the passage way of each arm in the length of the arm, and proportioning the ways through the plug as to avoid the construction which ordinarily occurs in four-way cocks. With this object the form may be circular at the extremities of the arms, and thence taper or change up to the plug seat, where the size may be diminished as presented against the cross section of the plug, and enlarged in the direction of the side or length of the plug, which, it is believed, will afford the means of constructing the cock with a plug of less diameter than heretofore, and though it may be only partially opened to admit steam, water, air, &c., will allow of a free and rapid exhaust.—Patent completed.

3405 T. Rose and R. E. Gieson, New Brighton. Utiliting

admit steam, water, air, ac., will allow of a free and rapid exhaust.—Patent completed.

3405 T. Rose and R. E. Gibson, New Brighton. Utilizing cotton waste. Dated November 10, 1868.

When fibrous cotton is treated or broken up by machinery to liberate the kernels, there is left, after the kernels (usually in a mealy condition) have been sifted out a waste material not hitherto utilized, consisting of the husks and fibre. This material forms a considerable proportion of the whole weight of the seed, and it is the object of this invention to utilize it in two important manufactures, viz., the fibre in the production of paper stock to be used in the fabrication of paper, and the husks in oil cake for feeding cattle. In carrying the invention into effect, the inventors first proceed to separate the husks from the fibre, as far as possible. For this purpose they moisten the whole material with water, and after it has laid for about twenty four hours, subject it to a disintegrating or tearing action, and to a sifting motion. This treatment removes all, or nearly all, the inner, and a large portion of the outer husks.—Patent completed.

3408 J. CLARK, Strand, W.O. Explosive compounds. Dated November 10, 1868.

This relates to improvements in the treatment, manufacture, and use of explosive compounds, which may be divided into the following parts, namely, first, a new mode of treatment in manufacturing pyroxyline, whether in the form of gun cotton, gun cloth, wood powder, or any other explosive compound, produced by treating vegetable there with mixed nitric and sulphuric acids. Second, the formation of explosive compounds into pellets or compressed charges. Third, an improved mode of applying glycerine oil in combination with other substances, for the production of an explosive compound.—Patent completed.

3409 J. HINE, Cockermouth. Millstones. Dated Novem-

3409 J. Hing, Cockermouth. Militaines. Dated November 10, 1869.
This consists in a rectangular frame having a longitudinal opening or slot, in which works the block containing the diamond or other cutter. This frame is firmly attached by means of a nut working in a slot at one end of said frame to a radial arm pivoted at the centre of the millstone, so as to turn freely.—Patent abandoned.

minisone, so as to turn freely.—Patent abandoned.

3410 C. E. and F. C. Winbr, Cardiff. Preenting collisions. Dated November 10, 1868.

The signal which is to be dropped on the line by a train is intended to burn for a greater or less length of time, for the protection of the train in advance. It consists of a paper or other case or cartridge filled with combustible matter, and terminating in a suitable fuse, to be ignited by friction or otherwise.—Patent abandoned.

8411 J. H. WILSON, Liverpool. Ships' waterclosets. Dated

2411 J. H. WILSON, Liverpool. Ships' waterclosets. Dated November 10, 1868.

Ships' waterclosets are constructed with dry wells or cisterns to receive, after use, the contents of the closets, so that the same may be emptied, when necessary, by force or lift-pump arrangements, or by compressed air arrangements, or other suitable means whereby the contents of the cistern or dry well may be emptied at the required height. The cistern or dry well into which the closet discharges is provided with a pump with discharge or nozzle coming through the sides of the ship or vessel, and with an air pipe leading from the cistern and opening also through the sides of the ship for the purpose of preventing accumulation of gas.—Patent completed.

8412 J. GREGORY, Kingswood. Retorts. Dated Novem-

3412 J. GEEGOEY, AIRGRAUGH. ALLERS. DESCRIPTION.

ber 10, 1868.

The retort is constructed by fixing a perforated internal cylinder inside a larger external cylinder by means of suitable projections attached to the outside of the internal cylinder, which are made to slide in longitudinal grooves, attached to the inside of the external cylinder, so that the two cylinders are held fast, and are made to rotate together.—Patent abandoned.

ther.—Patent abandoued.

3413 W. H. HALL and J. COOKE, Birmingham. Safety lamps. Dated November 10, 1868.

The burner is made by first cutting a shell for the bottom part, and this is made so that it can be screwed to any ordinary Stephenson lamp in place of the common burner screw. On the top part of this shell is placed a diaphragm, which contains or to which is fastened the wick tube. The diaphragm is raised in the centre to allow space for the pinions or small wheels to be worked for raising or lowering the wick; over this diaphragm and wick tube is placed a cone, which has an opening at the top for the flame to protrude, and several holes at the bottom to feed the flame. The wick tube is flat, and reaches to the top of the dome; the parts of the burner are fastened together at the centre, and the pinions with the spindle for raising the wick are placed in their respective positions at the time.—Patent abandoned.

3414 T. CAIN, Douglas, Treating potatoes. Dated No-

tive positions at the time.—Patent abandoned.

3414 T. CAIN, Douglas, Treating potatoes. Dated November 10, 1868.

After cooking the potatoes in the usual manner, the inventor causes air to be passed through and between them for the purpose of carrying off any water or steam that may be on or between them, and so prevent it from being mixed with the potato. After the steam or water is entirely driven off by the current of air, he passes the potatoes between two rollers, one of which has a plain or solid surface, and the other is covered with wire cloth or similar material. As the potatoes pass between these solid surface, and the other is covered with wire cloth or similar material. As the potatoes pass between these rollers, they are pressed in through the wire cloth into the interior of the roller which is covered with the wire cloth, leaving the skin on the surface of the wire cloth, whence it may be removed by hand or otherwise.—Patent

abandoned.

3415 J. Hickisson, Hackney. Marking lines. Dated November 10, 1868.

This consists in manufacturing a pencil of a composition of materials, such as are mentioned below, which will fuse, melt, or dissolve in such manner that the mixture, when fused, melted, or dissolved, may be run or cast into moulds of a desired form, and may be set or hardened therein. The composition in this condition will be fit for writing or marking purposes. The following are materials and proportions preferred:—Nitrate of silver, 100 parts; nitrate of potash, 100 parts; black platinum, 20 parts.—Patent completed.

Patent completed.

3416 C. J. Abbott, Harrogate. Distributing seeage scater.
Dated November 10, 1862.
The centre portion of the apparatus consists of two lightly constructed wheels capable of revolving upon a perforated tube which constitutes the axle. The ends of the tube project from the wheels, and are provided with flanges for the purpose of connecting additional perforated tubes thereto, and by means of which the range of the apparatus can be extended as desired, such additional perforated tubes being supported at their extremities by wheels, each of which revolves upon a short hollow axle, the same being loose and flanged on each side of the nave. The axle of the central portion of the apparatus is furnished with projecting bars from which strengthening ropes of wire or other suitable material may be extended to the extremities of the additional tubes for the purpose of keeping them in position, such ropes being tightened by means of any suitable contrivance.—Patent completed.

3417 W. Riddle, Larkhall-lane, S. Hooping bals.

of any suitable contrivance.—Patent completed.

3417 W. Riddle, Larkhall-lane, S. Hooping bales.
Dated November 10, 1868.
This relates to the method of hooping or bending bales by forming loops at the ends of the hoops which encircle the bale, and passing a stiff lath or spear through such loops, as described in the specification of a former patent, dated May 8, 1862 (No. 1876). The ends of the hoops on a bale are brought side by side, and the spear or lath is passed through the folded ends or loops. When the presents



sure is released from the bale, the hoops are not dependent on the elasticity of the bale for holding on to the spear, as the inner fold tightens on the spear with the strain. The spear should fit tolerably well, and it is preferred to bend the hoop red hot.—Patent completed.

the hoop red hot.—Patent completed.

3413 T. R. Crampton, Great George-street, S.W. Furnaces for liquid furt. Dated November 10, 1863.

The inventor burns the oil in a close furnace, into which he forces, by means of a fan, and at a comparative light pressure, the bulk of the air required for the combustion of the liquid. For this purpose he admits the creesote, or other combustible liquid to be burnt, into the jet or stream of air as it passes from the conduit pipe into the furnace or combustion chamber, and for this purpose he inserts the oil supply pipe into the top of the conduit pipe, in close proximity to the furnace, or just in front of the end of the conduit pipe. The liquid may enter into or in front of the air pipe in one or more streams. The invention also consists in employing solid fuel in combination with liquid fuel, by blowing the solid fuel in the form of dust into the furnace, as described in the specification of a patent, dated August 13, 1868 (No. 2539). The solid and liquid fuel may be introduced at the same orifice, or separately. By burning liquid fuel in combination with the solid fuel, perfect combustion of the solid fuel is more readily obtained.—Patent completed.

3119 H. BESSEMER, Queen-street-place, E.C. Cast steel

readily obtained.—Patent completed.

3419 H. BESSEMER, Queen-street-place, E.C. Cast steel and malteable iron. Dated November 10, 1863.

The chief object sought to be obtained by means of this invention is a more rapid and less expensive mode of fusing malleable iron and steel of different kinds, and obtaining cast steel and homogeneous malleable iron therefrom. In order to accomplish this the inventor avails himself of the property of gaseous fluids to rise in temperature in proportion as they are compressed, and he constructs furnaces of sufficient strength to withstand an internal pressure equal to two or more atmospheres, and retains in such furnaces the products of combustion under such an excess of pressure over that of the external air as will produce the high temperature necessary for rapidly fusing malleable iron and steel of any kind or quality.—Patent completed.

3420 T. VATGHAN and E. WATTEEU, Middlesborough.

nanty.—I ment compresent.
3420 T. VAUGHAN and E. WATTREU, Middlesborough.
crew botts. Dated November 11, 1868.
The inventors form the front or screwed end of the bolt Screw bolts.

The inventors form the front or screwed end of the bolt hollow, or with a recess passing some distance down the centre of the bolt, and when the nut is screwed up to the required degree of tightness they force a steel conical plug or mandril into the opening of the recess, so as to widen out that part of the bolt projecting beyond the nut, which is thus prevented from unscrewing. The steel mandril is then removed and employed in the same manner for other bolts.—Patent completed.

manner for other boits.—Patent completed.

3421 E. and F. DIXON, Cliptone-street, W. Packing boxes. Dated November 11, 1868.

This consists in an arrangement of springs and guides of metal and india-rubber, or other flexible substances, which are made to form compartments in number and size, according to requirements, and at the bottom of each compartment there is an elastic frame, grating, or spring substance, which secures the neck of the bottle, and the sides or griders hold the bottle in an erect position, and so firmly that no jarring can shift the bottle.—Patent abandoned.

3422 R. HALLIDAY Worsley. Oling area. Dated

Patent abandoned.

3422 R. HALLIDAY, Worsley. Olling axles. Dated November 11, 1863.

This principally consists in placing a trough or receptacle containing oil between the rails and below the level of the same, such trough or vessel being provided with a small force pump and four branch pipes extending upwards and outwards, and having at their ends small mouthpieces or jets which convey the oil to all four axle boxes at once.—Patent completed.

moutapieces or jets when convey the oil to all four axis boxes at once.—Patent completed.

3423 E. Mader. Swanses. Manufacture of tin plates. Dated November 11, 1868.

The object of this invention is to impart to black plates (whether composed of iron or steel) an even coating of tin or other metal, or a mixture of easily fusible metals. The plates are passed through a bath of molten metal covered with any suitable flux to prevent oxidation and assist in the union of the coating metal with the iron or steel plate. Or a plate already coated in any of the ordinary ways is passed through the machine to finish it. Each plate is guided into, through, and out of the bath by means of driven rollers and guide bars. The delivering reliers, or the last pair (if more than one pair is used), are so arranged with respect to the level at which the metal is to be maintained as to ensure that the bite of these rollers shall be below the surface of the metal, and these rollers may be formed with annular grooves to allow of the metal flowing freely to the plate.—Patent abandoned.

3124 W. S. Thomson, Cheapside. Corset, &c. Dated

3424 W. S. THOMSON, Cheapside. Corsets, &c. Dated November 11, 1868.

The inventor employs felted cloth as it comes from the

November 11, 1868.

The inventor employs felted cloth as it comes from the fulling mill or previous to its being stretched and finished for the market, or he manufactures felted cloth tubes especially for the purposes of this invention, his object being to obtain a woollen material that will admit of being moulded to the required shape, and which, when moulded, will retain the shape it has received. The fulled cloth, or partially manufactured material, is saturated with water, and in this state is applied to a metal mould or former the shape of which it is required to receive and retain.—Patent completed.

8 3425 M. H. DAVIES, Liverpool. Wire fences. Dated November 11, 1868.

In order to strain the wires of fences, the inventor arranges the straining posts with winders constructed as follows:—Each winder consists of anaxis passing through the two checks of the posts, and capable of turning therein. On one of the checks, around the hole which receives the axis, a toothed ring is formed, or the toothed ring may be otherwise fixed. The winding barrel has in connection with it a ring of internal teeth; they are formed inside a flange upon the barrel. The ring of internal teeth surrounds the fixed ring of teeth, and contains an additional tooth or teeth. The barrel is mounted upon an eccentric, formed upon the axis, on which it is able to turn, and the throw of the eccentric is such that, as it revolves, it brings the internal ring of teeth to gear with the fixed ring on every side in succession, and so, at each rotation of the axis, the barrel is turned the space of one or more teeth.—Patent completed.

8426 C. and J. Wilson, Hanley. Brick Films. Dated November 11, 1868. November II, 1868.

In order to strain the wires of fences, the inventor arranges the straining posts with winders constructed as follows:—Each winder consists of anaxis passing through the two checks of the posts, and capable of turning therein. On one of the checks, around the hole which receives the axis, a toothed ring is formed, or the toothed ring may be otherwise lixed. The winding barrel has in sonnection with it a ring of internal teeth; they are formed inside a flange upon the barrel. The ring of internal teeth surrounds the fixed ring of teeth, and contains an additional tooth or teeth. The barrel is mounted upon an eccentric, formed upon the axis, on which it is able to turn, and the throw of the eccentric is such that, as it revolves, it brings the internal ring of teeth to gear with the fixed ring on every side in succession, and so, at each rotation of the axis, the barrel is turned the space of one or more beth.—Patent completed.

3426 G. and J. Wilson, Hanley. Brick kilns. Dated November II, 1868.

The inventors make a number of openings about half

way up the kiln, through the external walls thereof, for the admission of cold air into the bags at or about the centre of the kiln, whereby they obtain greater courtol over the heat and prevent the formation of smoke. Three perforated "quarries" or fire-brick lumps or slabs are employed, placed one behind the other, and standing over the inner arch of the fire-hole. These perforated quarries further assist in preventing smoke, and serve to keep the fire to the bottom of the kiln. Extending straight down from the outer perforated quarry or brick above referred to is the regulator hole or passage, which communicates with a perforated hot and cold air chamber, immediately above the fire-hole. This regulator hole and chamber are for facilitating the supply of fuel to the fire-hole, and for admitting hot and cold air thereto. The front of the fire-hole is perforated with numerous holes, leading into various parts of the fire-hole, and supplying air thereto for keeping up an uniform and active combustion.—Patent completed.

3221 F. HOLMES, Marks Gate, Essex. Pipes for smoking.

3427 F. HOLMES, Marks Gate, Essex. Pipes for smoking.

3427 F. HOLMES, Marks Gate, Essex. Pipes for smoking. Dated November II, 1868.

This consists in making an orifice at the end of the pipe in continuation of the tube, and fixing a plug therein, which is made removable for the purpose of cleaning.—Patent abandoned.

3428 G. PIERCY, Halifax. Safety stay for carriages. Dated

3428 (A. Piercy, Halifax. Safety stay for carriages. Dated November 11, 1568.

In constructing a safety shaft stay, the inventor joints one end of a flat bar or piate of iron, hereinafter called the stay, to the outer wheel iron of the shaft by means of the bolt commonly called the "dragon tongue" bolt, the said stay being capable of turning in a vertical plane upon the said bolt. The other end of the stay is connected to the shaft, at the distance of a few inches from the shaft bolt, by means of a light collar bolt. The said collar bolt works in a slot in the end of the stay, the head of the said collar bolt works in a slot in the end of the stay, the head of the said collar and curved washer bearing against the inner side of the said stay.—Patent abandoned.

3429 J. Lewethewatte. Bury. Wood-shaping machinery.

said stay.—Patent abandoned.

3429 J. Lewthwaite, Bury. Wood-shaping machinery.
Dated November II, 1868.

The inventor uses cutters of various kinds fitted to the
machines, putting them in motion by animal, steam, or
other power, with the requisite degree of rapidity, and
the form to work by is produced by a metal, wood, or
other pattern or cam, which revolves either on a vertical
or horizontal axis, and thus guides the article to the
cutters in a similar form, the pressure against the cutters
being induced by a descending weight or weights, or by a
spring or springs, so arranged that the cutters only work
with the grain, one cutter working till it reaches the cross
grain, when it ceases to cut, and the work is taken up by
the opposite cutter, which thus works with the grain, and
a similar smooth surface is produced without what is
called splintering.—Patent abandoned.

3430 A. M. Clark, Chancery-lane, W.C. Cylinder print-

34:30 A. M. CLARK, Chancery-lane, W.C. Cy'inder printing machines. (A communication). Dated November 11, 1868.

According to these improvements, first, either movable According to these improvements, first, either movable characters or stereotypes may be employed in the same machine; second, both sides of the sheet may be printed at one time, by disposing two printing surfaces on the cylinder; and, thirdly, a continuous sheet or row of paper is employed, each roll answering the purpose of a gauge. The improvements may be employed either separately or in combination.—Patent completed.

The improvements may be employed either separately or in combination.—Patent completed.

2431 C. J. CHAPLIN, Bucklersbury. Cattle food. (A communication). Dated November 12, 1868.

After the operation of making and the completion of the fermentation, usual in the process of distillation from raw or malted grain, vegetables, or otherwise, it is proposed to separate the fluid portion of the wash, beer, wine, or cider from the grains or solid matter, by passing the same through a hair or other strainer, arranged for the purpose, after which the solid matter is subjected to gentle pressure, either by passing the matter through rollers or their equivalents, to rid it of the greater proportion of moisture. It is then passed into a tub or other vessel, furnished with an agitator. In this vessel is added to the mass a proportion of linseed meal, peas, meal, bran, or other farinaecous material, also aromatic substance. The ingredients are then thoroughly mixed or incorporated by the motion of the rake or agitator. The material is then transferred, either in bags or otherwise, to a press, and subjected to sufficient pressure to express the remaining fluid, and to form it into solid cakes. This may be accomplished by hydraulic pressure or otherwise, as may be most desirable. The cakes so pressed are then subjected to a stove heat in a kilu or room, arranged for the purpose of removing any remaining moisture.—Patent abandoned.

3432 S. and G. HOLT, Bacup. Pickers. Dated Novem-

3432 S. and G. HOLT, Bacup. Pickers. Dated November 12, 1868.
This relates to pickers employed in connection with looms for weaving, which are made of buffalo hide, and consists in forming them, in the first part of the process, open at the top, and then introducing a hollow top, or barrel of metal, or other suitable material, betwixt the two cheeks, or those parts through which the spindle holes are made, with a rivet passed through the said checks and hollow top to secure the same together. It is preferred to have a flange or collar at each end, which may be either cast or formed on the barrel, or added to it, as in using plain tubes, having a washer at each end, or the rivets may be formed with flanges or collars or shoulders thereon.—Patent abandoned.

8434 A.O. HELY, Stratford, E. Umbrellas, Dated No-

8434 A.O. Helly, Stratford, E. Umbrellas. Dated November 12, 1863.

This consists in so fixing the covering of an umbrella, sunshade, or parasol, to the frame, that it may be removed and refixed or replaced by another covering at pleasure, instead of being permanently fixed to the frame. This is effected by fastenings attached either to the covering or to the frame, or to both, whereby, without interfering with the present action of the parts, the one may be securely fixed to the other, and yet admit of being easily taken apart when desired.—Patent abandoned.

when desired.—Patent abandoned.

3435 T. B. COLLINGWOOD and W. HARDMAN, Boch dale Spindles and Hyers. Dated November 12, 1868.

This consists in arranging to radiate from a centre as many separate cutters as there are threads to be cut, so that such cutters can be simultaneously adjusted by a cone or other means, to and from the centre from which they radiate, and in cutting the threads on the spindle, by causing these cutters to rotate and advance at the same time against the spindle which is fixed, or in giving these screen movements to the spindle, the cutters being fixed, or in giving one movement to the spindle and the other to the cutters.—Patent completed.

2436 P. J. Lysky Manchester. Secting machine. (A

giving one movement to the spindle and the other to the cutters.—Patent completed.

3436 P. J. Livsey, Manchester. Seving machine. (A communication). Dated November 12, 1868.
This consists, first, in an upward manner of constructing the combination crank motion, and relates to a previous patent, dated January 2, 1865, No. 2. Second, in a peculiar arrangement of lever and link, in combination with the needle bar of a sewing machine and two stationary guides, by which the thread is controlled in making stitchea, and the quantity is regulated to suit thick and thin goods. The fulcrum of the said lever is adjustable on the presser har, or it may be fixed in the face plate, and the said link is jointed to the lever and needle bar. The thread to be regulated passes through a hole in the end of the lever. Third, in an arrangement of the shuttle driving mechanism, whereby greater durability, simplicity, and economy of construction is obtained; motion is taken from the rear, and of the upper shaft to give oscillation to a shaft below the table, upon the front end of which shaft there is an arm, having a rod socketed in it, with a partially round end that fits a part in the shuttle driver, which slides in a straight race, and is kept down by a plate secured by screws. Fourth, in an improved manner of suspending the feed wheel or device, and of raising and lowering the same when it is desired to sew thick or thin material which is accomplished by mounting the feed wheel or device upon a crank shaft, having a lever or arm on it, by moving which in one direction the feed is raised for thick material and in the other direction is to lowered for thin material.—Patent completed.

3437 D. Griffiths, Bradford, Yorkshire. Timber bearers.

2437 D. GRIPFITHS. Bradford, Yorkshire. Timber bearers.
Dated November 12, 1868.
This consists in cutting or removing the needless wood at certain angles from the extremities of a timber bearer, and placing the same in a central position to sustain the chief pressure.—Patent abandoned.

3438 W. R. GRIFFITHS, Bristol. Boilers. Dated Novem-er 12, 1868.

ber 12, 1868.

The inventor constructs the main part of the boiler in the form of a waggon boiler, and the firebars may be either solid, as usual, or made tubular, so as to contain water which will be heated by the incandescent fuel thereon. These firebars, if tubular, may be connected either at one or both ends with the main water chamber. Immediately above the fireplace there is another set of tubular bars also connected at one or both ends with the water space of the boiler. The heat from the fire below will act on these water tubes, and quickly generate steam, but in order to prevent the heated gases from passing between the tubes without giving off their caloric, flat iron plates are placed on the tubes, but space is left at the rear or inner end to allow the smoke and gases to pass up to the space above the tubes, and from thence out at the front of the boiler to a flue space above.—Patent abandoned. Patent abandoned.

3439 L. WRAY, Ramsgate. Crushing quarts. Dated lovember 12, 1863.
The crushing and grinding instrument is formed with urved surfaces, and is made to vibrate or oscillate on a centre.—Patent abandoned.

curved surfaces, and is made to vibrate or oscillate on a centro.—Patent abandoned.

3440 E. Haas, Mark-lane, E.C. Sewing machines. Dated November 12, 1863.

This relates to that class of sewing machines in which a single thread is used. The inventor employs a needle formed with a spring beard, similar to the beard of the needles of knitting machines; he also employs the needle to effect the feeding forward of the fabric. For this purpose the needle passes through a guiding hole in a plate which is held at a short distance above the table or plate, on which the fabric or work rests, whilst the upper end of the needle is fixed in a holder carried by the pin of a crank, which is on the end of the driving axis. The thread from the reel is led through a loop or coil of wire, which is fixed to the under side of the table of the machine just at the side of the slot therein, down through which the needle passes. When the needle has passed down through the work and through this slot, its lower end is by the movement of the crank moved sideways, which not only gives the forward feed to the work but swings the lower end of the needle from one side of the loop or curl of wire to the other. The thread which is lying in this loop is thus laid into the beard of the needle; as the needle again rises the beard is closed by its being brought against a fixed edge.—Patent completed.

3441 W. Donisthore, Trinity College, Cambridge.

fixed edge.—Patent completed.

3441 W. DONISTHORIES, Trinity College, Cambridge.

Getting coal. Dated November 12, 1868.

The inventor arranges the apparatus in such manner
that during the outward stroke a vacuum is produced by
the direct admission of the compressed air to the air
cylinder. The inward or cutting stroke is then produced
by means of this vacuum, aided by the expansion of the
compressed air from the inner end of the cylinder to the
outer end or ends of the same, or of another cylinder or
cylinders. In this way the waste of power which results
from allowing the compressed air to escape without previous expansion is avoided.—Patent completed.

3442 G. P. WHITE, Furnival's Inn. W.C. Scree piles.

vious expansion is avoided.—Patent completed.

3442 G. P. White, Furnival's Inn, W.C. Scree piles.
Dated November 12, 1868.
The shoe or foot is made with a thread of wrought from or wrought steel, in place of cast from. The thread may conveniently be a disc of sheet metal, with a hole in the centre and a radial slit cut from the centre to the circumference. The disc thus prepared is opened so as to form a screw of the desired pitch, and it is combined with a



boss to fit on to the end of the pile or post. This boss may be of cast iron, and then the wrought metal thread formed, as above described, may be placed in the mould and the boss cast upon it. Or the boss may be made in two parts or rings, separately fixed upon the pile or post, and holding the screw thread between them. Or the boss may be made in one piece with a spiral groove on its periphery, which receives the wrought metal thread, and the thread may be secured in the groove by a stop fixed in the groove behind it.—Patent completed.

3443 J. KRLIGE Tremadon North Welse. Cutting met.

the thread may be secured in the groove by a stop fixed in the groove behind it.—Patent completed.

3443 J. Kelloe, Tremadoo, North Wales. Cutting rock.
Dated November 12, 1863.

The machinery carries worm drills or borers, or rotating cutters. For boring, drilling, or making incisions, and also chiesel cutters or similar cutters. At the front of the machiner ear a number of worm drills or boring cutters, consisting of threaded or wormed rods or shafts, terminating in cutters which, preferably, are spear heads, or lance heads, or angular cutters. Cutting heads may be used alternating with each other, one cutter having sharp lateral angles protruding at the sides noxt which the edge of the next cutting head is straight or does not protrude, and so on. The drilling cutters are so mounted that one shall present its flat side to the surface to be cut, while the next presents its edge, and so on alternately. These drilling or boring cutters fit at their inner ends into collars or sockets, whence they are readily removable when out of action. They are supported on a frame capable of being slidden to and fro in a stationary frame. Such slidling action is effected by a worm actuated from the main driving shaft. They are also supported on two stout shafts resting on the main framework. Rotary motion is impacted to them by small philons or worm wheels, driven by a worm worked by gearing from a main driving shaft.—Patent completed.

3444 E. Owen. Blackheath. Night-light cases. Dated

3444 E. OWEN. Blackheath. Night-light cases. Dated November 13, 1868.

November 13, 1988.

The cases are impregnated in the course of their manufacture with tungstate of sods, phosphate of ammonia, borax, or other of the well-known materials, or compounds now used for rendering dresses and other fabrics fireproof.

—Patent abandoned.

—Patent abandoned.

3445 W. Thomas, Cheapside, E.C. Boots. Dated November 13, 1863.

The outer sole of the boot or shoe shape has a channel cut in the grain side round the edge to receive the sewing. To the inner or flesh side a strip of leather, about fin. wide is sewn along the said channel, with its outer edge corresponding to the edge of the sole. This welt is wetted and turned up at right angles close to the line of stitching, or the welt may have been previously damped and turned up before being sewn to the sole. The sole with the welt attached is fastened with its grain side to a last with the welt projecting. The upper, turned inside out, and having the stiffener in its place, is lasted and tackled, or lasted to the welt, and is then sewn to it. The welt and upper are now pared, and made to lie smooth on the sole; the last is withdrawn, the boot turned with its right side outwards, the inner sole and last put in, and the boot finished as usual.—Patent completed.

3446 B. P. Walker. Wolverhampton. Forging metals.

wards, the inner sole and last put in, and the boot finished as usual.—Patent completed.

3446 B. P. Walker, Wolverhampton. Forging metals.
Dated November 13, 1868.
This consists in the application of a copying principle to forging machines, such as those known as Rydor's forging machines, such as those known as Rydor's forging machines, or modifications thereof. A bolt or ram is employed, driven by a crank shaft and flywheel, as in the well-known Ryder machine, but in lieu of attaching a swage or die immediately to the lower end of the bolt, a lever is attached thereto, having its fulcrum at one end and a hammer face at the other, whilst it is attached to the bolt or ram at a point intermediate between the hammer face and fulcrum by a cross pin or suitable joint, so that the hammer face has a greater amount of motion than the ram. The fulcrum end of the lever rests upon a model or pattern, consisting of a piece of steel or other material, which is movable, and is shaped in accordance with the article to be produced.—Patent completed.

3447 J. DENDY and J. H. W. Biggs, Manchester. Arrangements of warps. Dated November 13, 1883.
This consists in an improved system of splitting the sheet of warp, in the sizeing or dressing machine, into several separate and distant warps, and in the arrangement and construction of improved warp or yarn beams, for sizeing or dressing machines, looms, and similar purposes.—Patent completed.

3443 R. A. Dalton and G. Barton, Coventry. Upholstery

2449 R. A. DALTON and G. BARTON, Coventry. Upholstery trimmings. Dated November 13, 1863.

The object of the invention is to manufacture these trimmings with fast edges or selvages, so that the edges will always remain perfect. For this purpose the inventors manufacture trimmings in a ribbon boom, and employ as the materials silk, worsted, and cotton, whereby the patentees obtain an upholstery trimming woven of the said materials with a fest adres on both sides. Pater comtees obtain an upholstery trimming woven of the said materials, with a fast edge on both sides.—Patent com-

pleted.

3449 C. E. BROOMAN, Fleet-street, E.O. Wall hangings.
(A communication). Dated November 13, 1863.

This consists in producing or effecting the painting or colouring upon metallic foll, by preference the foll. The inventors take thin the foll which possosses great flexibility. He spreads it upon a hard smooth surface, such as glass, taking care to damp the glass, in order to facilitate the spreading and retention of the foll. The foll thus spread constitutes a very smooth surface, on which he paints or colours in oil, either plain or ornamental, as on walls or wainscots. The inventor now allows the colour to dry and varnishes it. This portable painting, when removed from the glass with its lining of tin, is ready to be applied in a house or otherwise.—Patent completed.

3450. I Stephens Ryderstreet S.W. Carriage. Dated

3450 J. STEPHENS, Ryder-street, S.W. Carriages. Dated

November 13, 1863

November 13, 1863.

The inventor forms the attachments by means of vulcanized india-rubber, or othersprings; so long as the carriage is moving straight forward on even ground the spring attachments act simply as ropes, carrying the bearers over the wheel, and laying them in front in its course, but in passing over uneven ground, or round curves, they extend or contract, so as to let the bearers take a firm position on the ground without throwing undue strain on the connection.—Patent completed.

cylinder. Upon this cylinder they mount a sliding head, this head being made taper or conical at the outside, to suit the solidity they intend to give to the sand in the mould. This conical sliding head is fixed or attached to a strong crosshead. This crosshead is attached to a screw, which screw is fixed concentric with the cylinder and the moving head. The end of the screw is so constructed that it can be readily driven by gearing situated below the ordinary floor line. This screw is made to travel at such a speed that the loose head rises as the sand is being fed in at the top of the mould, so that the necessary solidity will be given to the sand. When this loose head has been raised to the length required, or, in other word, when the length of mould required has been made, then the cylinder is removed with its screw and loose head, and the mould taken into the stone, and the process repeated.—Patent completed.

3452 T. and A. T. Lawson, Leeds. Carding engines.

Patent completed.

3452 T. and A. T. Lawson, Leeds. Carding engines.
Dated November 13, 1868.
This consists, first, in making the shell of carding engine cylinders of wrought iron, either rolled or welded in one cylindrical piece. The shell thus made is connected with the ends of the cylinder, which are fixed on the axis by flanges and belts, or in other convenient way, or the shell may be made of severel such pieces. In making a carding engine cylinder of a number of drums or pulleys fixed on a shaft, the pulleys having cast-iron runs or shells, and hollow wrought-iron rims or shells and hollow wroughtion arms, and are thus carried by the axis, independently the one of the other.—Patent abandoned.

the one of the other.—Patent abandoned.

3453 C. MARKHAM and W. KNIGHTON, Chesterfield Moulding and drying moulds. Dated November 13, 1863.

The moulds for pipes or cylinders are formed in boxes suspended from the outer rim of a turntable, and, when moulded, the table is turned to bring them into a stove, which forms about half the circumference of one side of the circle, and the slide is shut across at either end of the stove between the suspended pipe boxes, and thereby about half the turntable with the pipes on the outer rim are enclosed in the stove, and the other half of the turntable remains open to the shop, wherethe moulding process is carried on; the moulds are thus swung into the stove upon the turntable upon which they are moulded.—Patent completed. completed.

completed.

343 R. A. Gold, Birmingham. Cabs. Dated November 13, 1863.

The inventor places the door at the back of the body of the carriage or cab, this door opening outwards, and he arranges the driver's seat at the front of the carriage or cab and on the roof theroof. The axle he places near the front of the body, and directly under the driver's seat. The seat for the person or persons riding in the carriage or cab is situated at the front of the body and over and parallel to the axle. The person riding in the carriage or cab are thus made to face the door at the back of the cab, the horse being concealed from view.—Patent completed.

3455 W. Burgess, Upton-on-Severn. Signal apparatus. Dated November 13, 1863.

ated November 13, 1863.

It consists of a barrel or tube provided with two projecting lugs, which slide on a vertical rod, rising from the centre of a base plate suitably fixed. An elbow plece projects from the vertical rod at its upper part, forming a fulcrum for a lever or trigger. One end of this trigger takes under the upper projecting arm of the sliding tube, and supports the latter in position, near the upper end of the vertical rod, by the end of a counter balance weight sliding on the other end of the said trigger. At the base of the tube is a nipple communicating with the interior on which is placed a precussion cap, the whole being closed by a conical or other shaped cap or cover, provided with a central pln or striker for acting on the percussion cap which ignites the charge contained in the tube,—Patent abandoned. bandoned.

3456 A. J. DEBLON, Fives-les-Lilles. Condensing rotary spine. Dated November 13, 1963.

3456 A. J. Deblon, Fives-les-Lilles. Condensing rotary engine. Dated November 13, 1963.

The rotary engine forming the subject of the present invention is expansive and condensing, and is characterized by the following features:—The steam cylinder is divided into a variable number of compartments, in which move a number of flyers or wings, which together form the piston of the machines. The employment of a hollow or drum cylinder, provided with steam escapes, and which receives motion from the driving that either by means of gear wheels, mounted on the said shaft, or any more convenient method. The erown of this cylinder is notched in as many places as there are wings to the piston, and corresponding with each of them.—Patent completed.

3457 O. JONES, Ealing. Treating sewage. Dated No-

3457 C. Jones, Ealing. Treating sewage. Dated November 13, 1863.
This consists in effecting the precipitation or deodorization of sewage, by the use of slaked lime, combined or mixed with hydrocarbons, such, for example, as petroleum or with the acid tar or residual product obtained in the treatment of ters, for and in the production of oils or other liquid hydrocarbons. Such mixture or compound is introduced into the sewage, just before it falls into a depositing tank. By this means, results are obtained as thoroughly satisfactory as by the more expensive salts hitherto used.

—Patent completed.

3458 W. N. NICHOLSON, Newark. Hay making machines.

3458 W. N. NIGHOLSON, Newark. Hay making machines. Dated November 14, 1868.

This refers to a pitent, dated July 6, 1954. No. 1485. The inventor now uses an intermediate or carrier pinion, which can be brought into gear with the pinion on the fork barrel, and with either the internal or the spur whoel at pleasure. When not required, he withdraws this carrier pinion, so that the sam simplicity is substantially retained, which is the characteristic of a former patent. In the nave of each travelling wheel he places two internal cog wheels, one smaller than the other. On the axie of the machine he mounts an eccentric cylinder, on which the fork barrels revolve, and by moving this eccentric cylinder round the axie he adjusts the position of the pinions on the fork barrels, so that they will gear with either of the two internal wheels.—Patent abandoned.

3459 J. B. GREEN, Bury. Size. Dated November 14,

or contract, so as to let the bearers take a firm position on the ground without throwing undue strain on the connection.—Patent completed.

3451 C. Markham and W. Knighton, Chesterfield.

Mowdling pipes. Dated November 13, 1868.
This consists in using talcum of that particular quality known as fine Fronth chilk, mixed with the size, as a substitute for tallow or sosp. After the flour mixture is made in the usual way for sizeing purposes, it is conveyed into a cistern to be boiled. When at boiling point, the intended to be cast. This cylinder is fitted with two or more grooves, running parallel with the axes of the

3460 T. Mills, Plumstead. Steam generators. Dated Novumber 14, 1863.

The firebox is constructed of a boiler (preferably of the upright form), of a coil or coils, of tubes or tubing, enclosed in a case, the fire being contained within the said coil, the bottom of which coil is connected by a tube or tubes, brought down outside from the upper part of the boiler, at the lower end of which tube or tubes is fixed a self-acting valve, placed in a horizontal position, which allows the water to pass on into the coil, the expansion of which water, through coming in contact with the heated tubing, closes the valve after it has passed through it.—Patent abandoned.

3461 W. Harrison, Fenton, Brick Hins, Dated No.

Patent abandoned.

3461 W. Harrison, Fenton. Brick kilns. Dated Novomber 14, 1863.

The inventor constructs the oven or kiln in the form of a long tunnel, provided with a chimney or flue at or near one end. The floor of the oven or kiln is provided with a transway or rails, upon which travel waggons, which are made of sufficient strength to carry, say, 2,000 bricks each.

—Patent abandoned.

Patent abandoned.

3462 J. HILL. Kensington Park Gardens. Preparing telegraph slips. Dated November 14, 1868.

The inventor arranges side by side a sufficient number of punches to produce all the varieties of letters or symbols required. These punches are acted upon by a lever through the intervention of a series of perforated plates constructed on the jacquard principle in such a manner that by bringing a certain plate between the lever and the punches only, those of the latter are acted upon so as to perforate the paper which represent the letter or symbol required, a fixed stop preventing the lever from moving further than is desired. The punches are, by preference, carried loosely by means of shoulders or notches in a plate actuated by a spring which withdraws them from the paper after the punching has been effected. The perforated plates may be actuated in various ways for bringing the required one between the lever and the punches.—

Patent completed.

3463 G. J. Worssam. Wenlock-road, N. Motive power.

Patent completed.

3463 G. J. Worssam. Wenlock-road, N. Motive power. Dated November 14, 1868.

The inventor avails himself of the property of bodies or objects of a certain specific gravity when immersed in a fluid of a greater specific gravity to rise or ascend to the surface of such fluid. He constructs these bodies of thin sheet metal, and preferably in the form of tubes or hollow cylinders with conical or flat ends. A number or series of these cylinders are hinged or linked together in a similar manner as the buckets of a chain pump. This chain of floats is passed over two sets of pulleys, discs, or arms, fixed to two horizontal shafts, the one placed vertically above the other, the said pulleys being formed to suit the shape of the floats. One half of this chain of floats passes through the centre of the tank holding the water or other fluid, and the other half passes outside the tank through the air. The floats, when in motion, enter through the bottom of the tank in the manner hereinafter described, and rise up by their buoyancy through the water; they then pass round the top pulley, descend outside the tank, and, passing over the bottom pulley again, enter into the tank, and so on.—Patent abandoned.

3464 R. Bechler and J. J. Hiors, Hatton-garden, W.C.

and, passing over the bottom pulley again, enter into the tank, and so on.—Patent abandoned.

3464 R. Becher and J. J. Hiors, Hatton-garden, W.C. Measuring flow of liquids. Dated November 14, 1863.

For a rain gauge the inventors employ appearatus constructed in the following muner:—The rain is conveyed to a measuring chamber which is supported by a float working in a chamber having a suitable quantity of quick-silver therein. Through the bottom of the measuring chamber is passed the longer leg of a syphon, the shorter leg of which nearly touches the bottom, whilst the bend of the syphon is coincident with the top of the measuring chamber, and is contracted so as to ensure the rain passing away from the measuring chamber by the longer leg of the syphon at a practically uniform level. The measuring chamber rises and falls according to the quantity of rain it contains, and is guided in its motion so as to ensure its rising and falling in a vertical line and prevent its turning on its axis.—Patent completed.

3465 H. E. Newton, Chancery-lane. Propellingvessels, (A. communication). Date I November 14, 1363.

This consists in the employment of one, two, four, or any other practical number of circular discs or annular rims or wheels mounted obliquely, and in different directions, upon a shift, and connecte it ogether, either at their edges, or along common chords or diametrical lines. The angle which represents the obliquity of the discs or rings with relation to their supporting soult is preferred to be about 154eg, but may be varied should any other inclination be required.—Patent completed.

## APPLICATIONS FOR LETTERS PATEIT

Dated May 1., 1869.

1513 T. Norris, Frome, Somersetshire. Mowing and cutting grass and other similar substances.

1514 A. Tatham, Ilkestone, Derbyshire. Improvements in the manufacture of barbed needles.

1515 T. and J. Fagg, Haymarket, Middlesex. Improvements in the manufacture of waterproof garments or overalls.

ments in the manufacture of the construction of india-rubber bags for the manufacture of the bats.

Temprovements in ball and

felt hats.

1517 J. Norton, Sheffield. Improvements in ball and other cocks, taps. and valves.

1518 J. Waterworth, Burnley, Lancashire. An improvement in firegrates suitable for stoves, domestic and other

fires.

1519 A. M. Clark, Chancery-lane. Improvements in tramway and other locomotive engines and carriages, and in the permanent way for the same.

1520 4. Alian, Leadenhall-street, City. Improvements in the means or appliances for securing sheet metal and buckled or other metal plates employed for rooting, flooring, enclosures, and for covering other surfaces.

1521 F. Watton, Old Hall Works, Wolverhampton, Stafford-shire. Improvements in coal vases.

1521 J. Woodward, Queen's Foundry, New Islington, Ancoats, Manchester. Improvements in gas and water meters.

meters.

1923 W. Benson, Allerwash House, Hexham, Northumberland. Improvements in treating or reducing ores.

1524 J. L. Clark, Westminster, and J. Brotherton, Wol-



verbampton. Staffordshire. Improvements in the manu-

of iron and steel tubes.

A. V. Newton, Chancery-lane. An improved mode of, and apparatus for, manufacturing paper-hang-

ings.

1528 E. C. Warburton, Exchange-buildings, Bristol. Improvements in apparatus for registering secret votes.
1527 F. Johnson and W. Hatchman, Little Love-lane. City. Improvements in umbrellas.
1528 W. Green, Garforth, near Leeds. A new mode or method of cleaning flower and garden pots, both internally and externally.
1529 W. Naylor, Mildmay Park, Middlesex. Improvements in railway brakes, and in apparatus connected therewith.

ments in railway brakes, and in apparatus connected therewith.

1530 J. H. Johnson, Lincoln's Inn-fields. Improvements in firearms, and in apparatus for filling the same.

1531 E. Taylor, Central Works, Market-street, Blackburn. Washing, wringing, mangling, churning, and agitating liquids.

1532 H. Livesey, Greenbank, Blackburn, and T. Collison, Blackburn. Improvements in velocipedes.

1533 J. Sawyer and J. Woodman, Islington, Middlesex. Improvements in the mode of, and in apparatus for, the propulsion of velocipedes and other vehicles.

1534 R. E. Keen, Red Lion-court, Fleet-street, City. An improved mode of, and means for, securing panes of glass, more especially designed for street lamps or lanterns.

glass, more especially uses and terns.

1035 A. V. Winkle, Southampton-street, Bloomsbury, Middlesex. An improved device for securing corks in

Middlesex. An improved device bottles.

1536 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in machines for manufacturing capsules for closing bottles, jars, and other vessels.

Dated May 19, 1869.

1537 E. H. and A. I. Solly, J. F. Hall, and R. Bailey, Congleton, Chester. An improved method of spinning or twisting two or more ends of yarn and simultaneously twisting the same into one thread.

1538 W. Martin, Manchester. Improvements in perambulators.

bulators.

1539 W. B. Lake, Southampton-buildings, Chancerylane. An improved process for obtaining gelatine and other products from animal substances.

1540 G. Martin, Lower Mills, Dursley, Gloucestershire. Improvements in the means of generating gases and chemical vapours employed in the manufacture of extract wool, and in destroying the vegetable material in mixed fabrics, and in the construction and arrangement of apparatus therefor, which apparatus is also applicable to other nurposes.

ratus therefor, which apparatus is also applicable to other purposes.

1541 P. M'Gregor, Falcon Works, Manchester, Improvements in machinery for spinning and doubling.

1542 J. T. Lucas, Brecknock-road, Camden-road, Middlesex. Improved velocipedes.

1543 J. E. and A. Dowson, Victoria-street, Westminster, Improvements in the construction of foundations for piers, bridges, and such like structures.

1544 A. W. Banks, Newgato-street, City. Improvements in velocipedes and other like vehicles.

1545 W. Mitchell, Waterfoot, Lancashire. Improvenents in the manufacture of felted cloth, and in the machinery or apparatus employed in such manufacture.

1546 D. Roberge, New York, U.S.A. An improvement in those for horses and other animals.

1547 G. V. Fosbery, Cowley, Middlesex. Improvement in procedular in the machinery of the machinery of the manufacture.

2521 G. V. Fosbery, Cowley, Middlesex. Improvement in the machinery of the manufacture.

1546 D. Roberge, New York, U.S.A. An improvement in the machinery of the manufacture.

1547 G. V. Fosbery, Cowley, Middlesex. Improvement in the machinery of the manufacture.

1548 D. Roberge of the manufacture.

1549 G. V. Fosbery, Cowley, Middlesex. Improvement in the machinery of the manufacture.

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1543 F. Zysel and O. Burdett, Birmingham. Certain

1544 F. Zysel and O. Burdett, Birmingham. Certain impresements in velocipedes.

15'9 W. M'Adam, Glasgow. Improvements in the mar ufacture of pottery, and in the machinery or apparats a employed therefor.

1550 W. M. Moore, Balscaddin, Howth, Dublin. Improvements in caps or covers for the tops of bottles and other like receptacles.

1551 J. Langham, Leicester. Improvements in ash pans for firegrates.

1552 W. F. Fuller, Bank, Worthing, Sussex. Improvements in apparatus for securing or fastening the doors of

ments in apparatus for securing or fastening the doors of safes and strong rooms.

1553 J. Bowman, Peasholme Green, York. Improvements in fittings for window blinds.

1554 A. J. Dudgeon, Millwall, Middlesex. Improvements in propelling vessels by means of water.

1555 A. L. M'Gavin, Barge-yard, Bucklersbury, E.C. Improvements in propelling and manœuvring vessels, and in the apparatus employed for such purposes.

1556 A. L. M'Gavin, Barge-yard, Bucklersbury, E.C. Improvements in constructing and propelling ships and other vessels.

Dated May 20, 1869. 1557 Z. E. Coffin, Newton Center, Massachusetts, U.S.A.

Improvements in stop cocks or valves.

1558 C. C. Parker, Brooklyn, New York, U.S.A. An
improvement in cord tighteners for curtain fixtures.

1559 G. Perkin, Durby. An improved cup-and-ball G. Perkin, Derby. An improved cup-and-ball

castor.
1560 A. A. Rossignolf, Rue de Villiers, Paris. Cer
improvements in electric clocks.

1560 A. A. Rossignolf, Rue de Villiers, Paris. Certain improvements in electric clocks.
1561 J. Reid, Glasgow. Improvements in communicating between passengers and persons in charge of railway trains, and in appearatus employed therefor.
1562 J. M.Millan, Dumbarton, North Britain, and J. M'Gregor, Glasgow. Improvements in the preservation of iron and steel, and structures composed thereof.
1563 M. Jarvis, Mansell-street, Goodman's Fields, Middlesex, and E. Millward, Northern-buildings, Skinnerstreet, Somers Town, Middlesex. Improvement in lock spindles and door knobs to be used therewith.
1564 T. Herbert and J. C. Fowler, Riverhall-street, Surrey. Improvements in means for conducting electricity for communicating or transmitting signals and alarms.

1565 H. E. Newton, Chancery-lane. An improved portmill

able coffee mill.

1568 J. P. Nolan, Royal Artillery Barracks, Shoeburyness, Essex. Improvements in apparatus for measuring distances, particularly applicable to warlike purposes.

1567 W. B. Lake, Southampton-buildings, Chancerylane. Improvements in boat-detaching apparatus.

1568 G. Johnston, San Francisco, California, U.S.A. Improvements in the distillation of spirituous liquors, and in apparatus to be employed therefor.

Dated May 21, 1869.

1569 J. G. Tongue, Southampton-buildings, Chancerylane. Improvements in machinery for cutting wood or other substances.

1570 S. Jackson, Bradford, Yorkshire, Improvements 1571 E. H. Pulbrook, Tooting, Surrey. Improvements

organs.

1572 W. H. Dupre, Jersey. Improved apparatus for ving light and ventilation to rooms, houses, or other giving light and

giving light and ventilation to rooms, nouses, or outer-buildings.

1573 A. Munro, Arbroath, Forfarshire, and W. B. Adam-son, Glasgow. Improvements in treating certain metallic substances and certain metallic articles.

1574 J. Platt, Birmingham. Improvements in the manufacture of brooms and brushes.

1575 C. W. Siemens, Great George-street, Westminster. Improvements in calcining and smelting ores, and in furnaces and apparatus employed in connection there-with, which furnaces are also applicable to other pur-noses.

poses.

1576 A. M. Clark, Chancery-lane. Improvements in apparatus for facilitating the opening of eggs.

1577 W. R. Lake, Southampton-buildings, Chancery-lane. An improved machine for shearing, punching, bending, and otherwise working metal and metallic

articles.
1578 C. J. Forster, Maldon, Essex. Improvements in obtaining the transverse reciprocating motions of the cutter bar in resping, mowing, and other similar agricultural machines, and improvements in whoels for agricultural machines, which last-named improvements are also explicitly to reputing naming mytholes.

tural machines, which last-named improvements are also applicable to traction engine wheels.

1579 N. Lawrence, Great Prescott-atreet, Goodman's Fields, Middlesex. Improvements in lighting cigars.

1580 J. Hudson and C. Catlow, Burnley, Lancashire. Improvements in looms for weaving.

1581 W. Morris, South Hackney, Middlesex. Improvements in connecting and securing together the rails of railways.

railways.

railways.

Dated May 22, 1869.

1582 H. R. Lumley, Marlborough-place, St. John's Wood. Improvements in treating and purifying crude iron, and in making steel, and in an apparatus for such OSS. R. Orley, Axminster, Devonshire. Improvements

1833 K. Orley, Axminster, Devonshire. Improvements in invalid bedsteads.

1834 J. Lockwood, Leeds. Improvements in couplings for railway engines, carriages, and waggons.

1835 E. T. Hughes, Chancery-lane. Improvements in horse-shoe nails, and in machinery for the manufacture of

1885 E. T. Hughes, Chancery-lane. Improvements in horse-shoe nails, and in machinery for the manufacture of the same.

1886 G. T. Bousfield, Loughborough Park, Brixton, Surrey. Improvements in machinery for casting iron.

1887 J. H. Davis, Fenchurch-street, City. Improvements in ships' compasses.

1888 M. Tildesley, Willenhall, Staffordshire. Improvements in the manufacture of sash pulleys.

1889 S. Thomas, jun., Redditch, Worcestershire. Improvements in envelopes or wrappers for needles.

1890 W. H. Bliss, Bayswater, Middlesex. Improvements in the arrangement and construction of velocipedes.

1891 L. J. Crossley and R. Hanson, Halifax. Improvements in steaming yarns, and in apparatus employed therein, part of which improvements are also applicable for regulating the pressure of steam and other fluids.

1892 W. Furness, New-street, Borough-road, Surrey. A new or improved clip or fastening for uniting the ends or other parts of driving belts or bands, applicable also to braces and other useful purposes.

1893 W. Mitchell, Manchester. Certain improvements in the method or process of grinding metallic articles, and in the mechanism connected therewith.

1894 B. F. Weatherdon, Chancery-lane. An improved reacting turbine wheel.

1895 W. A. Gilbee, South-street, Finsbury, Middlesex. Improvements in ice houses, store rooms, and refrigerators.

# NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Gazette," May 25, 1869.

From the "London G 85 C. Newsome 100 J. Steel 103 L. Hannart 106 C. P. Coles 109 R. Watson and B. Dangerfield 118 H. Vavasseur and C. M. Wade 116 J. H. Kitson and J. Kither 208 T. Cook and J. son
210 W. E. Gedge
228 W. E. Newton
244 A. V. Newton
256 J. H. Johnson
262 A. C. Pass
289 T. Whimster
308 A. V. Newton
311 C. Hoult
251 W. E. Newton
352 H. Jones
355 F. Braby
361 J. H. Johnson
363 A. Clark
376 E. Meldrum
425 W. R. Lake
521 W. R. Lake
521 W. R. Lake
521 W. R. Lake
521 W. R. Lake
544 A. V. Newton
753 J. H. Johnson
753 J. H. Johnson
753 J. H. Johnson 208 T. Cook and J. Wat-Kirby
117 T. Cook and J. Watson
122 J. Steel
126 D. P. Wright
130 P. Spence
132 E. Craddock
137 S. Bussell
140 J. G. Johnson
141 J. H. Johnson
146 W. Thomas
148 F. Braby
157 P. Oldfield
159 G. B. Postlethy 753 J. H. Johnson
968 R. Johnson
1046 G. S. Chase
1260 J. Major, W. Wright,
and G. H. Jones
1291 G. Hawxhurst and J.
Pollock
1300 R. Marshall
1316 R. B. Forbes
1321 W. R. Lake
1351 R. Saunders
1426 W. E. Newton
1430 W. R. Lake
1462 W. F. Do la Rue 159 G. R. Postlethwaite 160 J. W. Price 170 W. and J. Pain 176 C. E. Brooman 160 J. W. Price
170 W. and J. Pain
176 C. E. Brooman
178 J. Siddeley and F.
N. Mackay
179 F. A. Paget
189 C. de Bergue and C.
Faure
202 B. Craic 202 B. Craig 203 M. Tildesley

# PATENTS ON WHICH THE STAMP DUTY OF £50

•		I MID.
1410 J. Bernard	1	1459 J. W. Evans
1418 J. Brown	1	1481 G. Spencer
1433 A. Crichton	- 1	1497 R. B. Boyman
1452 T. Greenwoo		1551 E. Farmar
1457 T. Green		1602 J. Holloway

# PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1544 J. Needham 1554 P. M'Gregor 1639 G. Ermen and R. Smith 1424 H. Cartwright 1467 J. Dicker 1505 E. J. Bridell 1521 W. Naylor

### LIST OF SEALED PATENTS. Sealed May 22, 1869.

period mal	y 22, 1869.
3546 W. Inglis	3621 A. M. Clark
3549 W. La Penoticre	3642 A. M. Clark
3551 E. T. Hughes	3646 W. M. Lellan
3552 J. Howlison	3672 P. Hooker
3555 W. H. Ibbett	8673 A. M. Clark
3568 W. G. Beattle	3704 R. Girdwood
3569 C. W. Siemens	3707 A. V. Newton
3572 W. Dinwoodie	3730 W. J. Thiethener
3578 J. Parry	3763 C. E. Brooman
8582 T. Craig	3800 T. Lynch
3584 W. R. Lake	3812 M. Lockhart
3585 S. Brook and C.	8858 J. Edridge and J
Thompson	Merrett
8588 G. Baker	8927 J. W. Wilson
3590 W. E. Gedge	3984 D. Spill
8592 E. T. V. Hecke	321 W. E. Newton
3602 A. M. Clark	443 A. V. Newton
3611 J. H. Moreland and	598 G. J. Hinde
J. Conlong	700 R. F. Piltz and T. H
3613 E. Stevens	Lee
8614 J. S. Templeton	856 H. E. Newton
3615 A. C. Bamlett	966 T. Greenwood and J
8620 J. H. Dales and J. F.	Keats
Maygrove	

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Donior maj	20, 1000.
8606 A. Busche 8607 E. T. Hughes	8711 B. Fowler, D. Greig, and R. Burton
3608 H. Pollack	3731 J. A. Farwig and C.
3612 A. Harris 3616 T. G. Webb	Haynes 3790 R. Norfolk
8618 T. and A. L. Dickins and H. Heywood	3843 G. H. Benson and W. G. Valentin
3622 W. Tranter	8861 T. Spencer
8623 J. Ingham and I. Butterfield	422 J. A. F. Suter and T. C. Hinde
8625 A. Wyllie and J. Latham	597 J. A. F. Suter and T. C. Hinde
8626 H. J. H. King	859 W. R. Lake
3628 A. N. Burton 3629 W. E. Gedge	896 W. E. Newton 904 W. R. Lake
8638 J. L. Norton	940 W. R. Lake 941 W. B. Lake
3633 L. Pfeiffer 8669 S. C. Lister	1004 S. K. Hoxsie
8683 R. Hornsby and J. E. Phillips	1017 F. Boyd 1029 C. Cairns
3684 H. Kinsey	1090 W. B. Lake
8744 G. P. White	

PROVISIONAL PROTECTION FOR SIX MONTHS Has been granted upon Specifications bearing the fol-lowing numbers:—

1208	1323	1406 1408	1416	1424	1434	1442	1454
1233	1302	1408 1410 1414	1420	1428	1438	1450	1460
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#### OF SPECIFICATIONS PUBLISHED LIST For the week ending May 22, 1869.

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NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be sont, payable to Robersson, Brooman, and Co., Patent Department, 166, Fleet-street, London, E.O., to whom all communications upon the subject should be addressed.

Science and Art .- A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to and they cannot be too strongly recommended to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVI.]



#### **MECHANICS'** MAGAZINE.

LONDON: FRIDAY, JUNE 4, 1869.

# PROPOSED ABOLITION OF PATENT

THE name of Sir William Armstrong has become immortalized in the annals of the British Association by two things chiefly. Upon one occasion, he startled the world by the announcement of the probable and imminent exhaustion of our coal fields, and at another time—in 1862—he made a furious onslaught upon the principle of our patent laws. Sir William's point of attack was, as might be expected, that of a manufacturer who had an idea which he wished to work out, but could not do it because another man's patent stood in his way. Of course, it was open to him to buy the invention at a stated price, but this was neither so convenient nor so economical as getting the Legislature to sweep away all protection from inventors, so as to be able to adopt their plans without let or hindrance. In a word, the necessity of buying inventions which he wished to adopt, hampered the manufacturer, and, in his eyes—as well as in the eyes of the supporters of free trade in other people's ingenuity—this objection was fatal to the whole patent system. This took fatal to the whole patent system. This took place just seven years ago, and a considerable stir was created at the time. Since then, however, matters have been quiet in this direction, with the exception of an occasional agitation for reform, which, in some respects, is really needed. Recently, however, another specious attempt to appropriate the work of other men's brains has been made in another and more important quarter. We need hardly say we refer to Mr. Macfie's recent motion in the House of Commons. Last Friday evening, that gentleman moved a resolution to the effect that the time had arrived when the interests of trade and commerce, and the progress of the arts and sciences, would be promoted by the abolition of patents for inventions. The motion was seconded by Sir R. Palmer, who held that arts and manufactures in this country had attained such a point that props of this artificial nature might be well dispensed with. As might naturally be expected, a long and animated discussion ensued, and, as might also naturally be expected, it ended in a withdrawal of the motion. The Attorney-General who knows something of the working of the patent laws, very justly condemned the resolution as a dangerous experiment, and one which ought not to be made without full and searching inquiry. There were, he observed, no doubt, evils in the working of the present system; but these could be remedied, and the Legislature should certainly try to amend and improve before abolishing. One recommendation of the Royal Commissioners would certainly be a great improvement. He alluded to the trial of patent cases by a judge, with one or two scientific men as assessors, instead of by a jury. He believed that the working classes, as a body, were opposed to the abolition of the patent laws.

Now, it so happens-as in Sir William Armstrong's case—that Mr. Macfie is a manufacturer, one of the only class which would benefit even temporarily by the abolition of the patent laws. But for the credit of that class, we can point to another member, who—to his honour be it recorded—stood boldly up for the rights of the inventor, generously repudiating Mr. Macfie's unjust proposal. This was Mr. Mundella, whose opening remarks were as follows:—He wished the House to was Mr. Mundella, whose opening remarks were as follows:—He wished the House to consider what would happen if the patent laws were abolished. He had been for twenty-five years connected with manufactures as an mind as we write which would overwhelm

employer, and during that time, he might say, he had more than twenty patents, in every one of which he had a working man in partnership with him. He had never made an invention in his life; he did not know in his neighbourhood of one invention made by an employer. Inventions were generally made by working men; and a working man now received from his hon. friend, the member for Bristol, and himself, a third share of the profits of a patent invention, which produced to him a very considerable sum annually. He had himself gone into a garret, where he found a poor man working on a circular re-volving machine, which he had fixed on the bottom of a wooden chair—the only chair in the room. For years he had been patiently working at it. It was completed. It was patented. He purchased it. The poor man had his share, and was now in comfort and independence. No parties had a greater interest in the maintenance of the patent laws than working men, who if they received no protection here for their inventions, would soon carry them off to France or America. Such was the tenour of Mr. Mundella's speech, which, to the end, was plain, outspoken, and honest, and will assure the poor inventor that he has at least one friend to stand by him in the Houseone who could and would carry matters much farther if the hour of need came. Nor does Mr. Mundella stand alone. With him also we are proud to associate Mr. John Howard, of Bedford, whose experience has taught him the value of patented inventions, and whose honesty of purpose showed itself in his re-marks in the House upon the present question. The threatened danger, however, is for the present averted, and Mr. Macfie, satisfied-or more probably dissatisfied—with having elicited a discussion, withdrew his motion. Here, then, the matter rests, and Mr. Macfie has earned for himself the unenviable distinction of having proposed the abolition of the only protection at present possessed by the great mass of our meritorious inventors.

We must certainly confess to not having been over anxions as to the issue of the event in the House of Commons. We felt event in the House of Commons. assured that the present Government, with all their desire to abolish existing institutions, and to reverse many of the decisions of their predecessors, would not succeed in breaking down the barriers of the British inventor's stronghold. The motion has broken down on the threshold. But although this is the case, we cannot let the present opportunity pass without a few words more upon the patent law. The recent attack upon it justifies our remarks, which we know will be echoed by every one of our readers. We would ask all rash intruders upon the rights of the inventor if it is nothing that the patent system has attained to dignity by age and prescription? But, above and beyond all this, is its utility and very fitness to the social condition of nations. At home, abroad, wherever civilization has impressed its stamp. there the patent system is adopted with manifest advantage. What of its prosperity does not our own land owe to this system? Our colonies and dependencies recognize the fact that the patent system underlies the successful development of their commercial interests, and they adopt it. Everywhere public and private enterprise bear incontrovertible testimony to its efficacy, whilst our national commercial standard has unquestionably been elevated by its agency. These are a few of the considerations we would submit to those who, like Mr. Macfie, consider that "the interests of trade and commerce, and the progress of the arts and sciences, would be promoted by the abolition of patents for inventions," as well as to those who, like Sir R. Palmer, think that "the arts and manufactures in this country have attained such a

every argument advanced in support of so mischievous a proposition, but we find them so fully and forcibly set forth in a recent able article upon the subject in the "Standard. that we gladly reproduce that article on another page. It is enough for us that we have witnessed the prompt and decisive defeat of a proposal which struck deeply at the root of our national prosperity. It is enough that the end followed so immediately upon the beginning. It is enough that we have such plain outspoken men as Mr. Mundella amongst us to expose those who seek private aggrandisement under the pretext of public good, and who seek to elevate prejudice into principle. We ask men of all classes to pause before they listen to idle and meaningless clamour, and before meddling with a system by which private firms and public companies have attained affluence, by which also work is provided for many hands, and public wealth and comfort are increased. Let none commit themselves rashly to a course of action inimical to the best interests of the State, because dull and idle persons are precluded from availing themselves of the brains of brighter men. England would have cause enough to regret if she were to refuse justice to the inventor, and, in being unjust to him, were unjust to the millions whom his skill and genius enrich and benefit.

## LAYING CULVERTS UNDER THE BEDS OF RIVERS AND CANALS.

HERE is always more or less hazard and risk in disturbing what may be called existing state of things." Nevertheless, it becomes imperatively necessary, on certain occasions, to incur the risk of so doing. Of all the examples of engineering practice, in which a corroboration of this statement is to be found, that relating to interfering with the status quo of the beds and banks of rivers and canals affords the most conclusive one. Numerous have been the accidents, and dire the consequences of excavating even in the approximate locality of these situations. It is impossible to observe too much caution in conducting operations of this nature, which have now become more frequent than formerly. This is partly owing to the fact that rivers are no longer regarded as inseparable barriers between their opposite shores, and that attention has, during the last few years, been prominently drawn to the practicability of effecting a communication underneath instead of overhead. This has been exemplified on a gigantic scale by the proposed submarine communication between England and France, and is being practically carried out by the Waterloo and Whitehall Pneumatic Company, and by the construction of the subway under the Thames at the Tower. Although not arrived at this pitch of subfluvial tunnelling, the French have accomplished something in that line, by the large syphon tube recently successfully laid under the Seine, to connect the sewage channels on each side of that river. The laying of culverts and pipes under embankments has always been a source of anxiety and trouble to the engineer, even when the embankments are made at the same time. It is needless to point out how greatly the trouble increases, and how much greater need there is of precautionary measures, when the case involves the undermining of a bank already in situ.

There are two very prominent instances to be adduced where the laying of pipes and culverts underneath the banks of water reservoirs were attended with leakage and bursting. The one is the well-known catastrophe at Bradfield, some few years ago. The other is the leakage and subsequent emptying of the

working defects, there is very little doubt about the latter. The extrados of the arch of the culvert was left nearly smooth, without any offsets, steps, or "racking back," afford a firm hold of the puddle of the bank. In fact, there was really a straight joint between the puddle and the masonry, whereas there should have been a union as intimate as it was possible for ingenuity to imagine. As might be expected, the water found out the "weak spot." The result was the emptying of the reservoir, which had taken months to fill, and the plunging of the Dublin Corporation into litigation, which entailed upon it a large amount of expense. In many of the towns where new sewage works are in course of construction, it has been necessary to lay iron pipes below the beds of the adjoining rivers and canals, both for the purpose of effecting a communication between the sewers upon the opposite sides, and also, in some instances, to constitute a channel of conveyance for the sewage to the fields intended to be irrigated. This subaqueous plan has been adopted at Norwich, where very extensive drainage and sewage works are in progress. Some idea of their extent may be gained from the fact that they are estimated to cost £60,000. Provided the foundation he good, and concrete be used liberally, the only point presenting much difficulty is the joints, which sometimes give a great deal of trouble.

The depth to which the drains must be sunk depend, in the first place, upon the levels; and, secondly, upon the condition of traffic in which the river is placed. If the river be navigable, and used for the purposes of navigation, the pipes should not be placed too near the surface, and should be well protected, especially about the joints, with cement concrete, or they are liable to be damaged by the anchors of boats. Were there any choice in the matter, it would always be preferable to take the drain or pipe over instead of under the river, but it is seldom that the levels are so entirely optional as to afford the right of

An instance of the bursting of a canal embankment, in consequence of excavating underneath it, for the purpose of constructing a culvert, occurred a very short time ago. It appears that a portion of the embankment of the Napton and Warwick Canal, on the Warwick side of the river, was washed away, The breach made was nearly 40ft. in width, and the water escaping through it with great velocity completely inundated the adjoining fields, and did a great deal of mischief to the young crops and property. Although the conclusion is not absolutely an infallible one, that the proposed construction of the sewer was the cause of the accident, yet, when it is borne in mind that the excavation was carried on in close proximity to the breach, it is difficult to trace the effect to any other cause. As a rule, we should prefer in these hazardous situations to lay cast-iron pipes instead of building a culvert. The time which the disturbance and interference with the existing bank occupies is of equal importance with the nature of the operations carried on. A much shorter time will suffice to lay in a pipe than to construct a culvert of brickwork or masonry. The former will also require less excavation than the latter, for supposing them to have the same internal dimensions, the arch, invert, and side walls of the culvert, will necessitate the taking out of a considerable additional quantity of earth. These proportions in a cast-iron pipe are simply its thickness, which practically is inappreciable. Besides, an increase in the capacity or internal size of the pipe, produces little or no corresponding difference in the thickness. With the exception of the difficulty sometimes experienced in making good the joints, there is no comparison with respect to the relative facilities of the two methods for establishing a speedy and secure communication between the opposite banks. The manner in which the canal is constructed, at the ing the special attention it deserves, was a

place where the intended pipe or culvert is to cross, has a very great effect upon the risk attending its successful laying. Should the canal be carried altogether in an embank-ment, and the levels not permit of the pipe being laid in the natural ground, but require it to be placed in the artificial bank, the danger is seriously augmented. Not only is the foundation more treacherous and insecure, but the earth above is more liable to subside than if it consisted of a thin stratum of the natural surface. Subsidence is not necessarily a forerunner of leakage or bursting, but it frequently does precede those serious contingencies, and may be regarded as a warning sign which should never be disregarded. A distinction must be drawn here between the ordinary subsidence, which invariably follows the erection of every new bank, a short time after its construction, and that for which there is no apparent cause. The former is always expected, and provision made accordingly for raising the bank to its proper level. The latter should be at once carefully inquired into, and a constant watch set on the spot.

# CONVERSAZIONE AT THE INSTITU-TION OF CIVIL ENGINEERS.

N resuming our notice of the exhibits at the recent conversazione in Great Georgestreet, we will first refer to the very ingenious method devised by Mr. S. P. Bidder, jun., for locking miners' safety lamps. On the bottom being screwed on, a bolt is pressed upwards into a recess by a spring, and can only be withdrawn by means of a powerful electro-magnet, which is to be kept in the lamp room. This entirely dispenses with the lock and loose keys. Mr. Bidder also exhibited a model of a machine for breaking down coal without the use of gunpowder, which illustrated a system possessing great merit. next thing we shall notice is one of Harrison's synchronous clocks, before describing which we may premise that one of the projects in the formation of the London District Telegraph Company was the diffusion of Greenwich time by telegraph throughout the City and the suburbs. The Astronomer Royal offered every facility for obtaining either hourly or—if desired—minute currents from the Royal Observatory. It then remained that the translation of sleek health as a content of the co that some kind of clock should be constructed which would record the precise moment at which the hourly current was received. Many attempts were made by which a delicate regulator could be set for five seconds of error either fast or slow. The clock exhibited by Mr. Harrison will correct itself for any degree of error, whether fast or slow, on the receipt of a feeble current of electricity. Mr. Harrison seems to have made himself acquainted with the difficulties which surrounded the setting mechanism, and has, in a simple manner, shown that, submitted to the severest tests, a clock of the most ordinary construction can be corrected and made to show the true time by a very simple process of electrical setting. The setting of the synchronous clock is performed by the clock itself on receipt of a current of electricity for any degree of error in hours, minutes, or seconds, whether fast or slow. No electrical break in a line of clocks, however distant or numerous, is required. Residuary magnetism is impossible, the armature being raised 90deg. from the coils, until it is placed, after an interval of thirty minutes, in position by the setting apparatus. For all purposes where correct time is required, such a clock must be invaluable. For some time past, the Astronomer Royal, Mr. Ellis, Mr. Denison, and others, have been urging the construction of such a clock as the one so successfully designed by Mr. Harrison.

working model of Mr. Hodgson's wire rope transport system. This invention, which was described by us in the early part of the present year, has now been carried out in various places, the successful results of its working at the Bandon Hill quarries having stamped it as a practical invention. main object is the construction of light and cheap ways for the transport of mineral or agricultural produce in localities as yet un-provided with railways. The system may briefly be defined as a continuous development of the plan now not unusual in India, Australia, and in some mining districts, of bridging over a river or ravine by a single wire rope, by which the loads are carried in a bucket suspended by a pulley, and are thus transmitted from one point to another. The importance of this invention in connection with the transport of minerals justifies here a farther reference to the details of the system. To accomplish the easy passing of the points of support necessary to carry out a continuous line of communication, and to provide for the distribution of the and the application of motive power, have been problems of no small difficulty. After experiments on a first trial length of half-amile, during the autumn of last year, these practical details were worked out, and a line of three miles in length, near Leicester, has recently been completed. This wire consists of an endless wire rope, supported on a series of pulleys carried by substantial posts, which are ordinarily about 150ft. apart, but, where necessary, much longer spans are taken, in one case amounting to nearly 600ft. rope passes at one of its ends round a Fowler's clip drum, worked by an ordinary portable steam engine, and the rope is thus driven at a speed of from four to six miles an hour. The boxes in which the stone is carried are hung on to the rope at the loading end, the attachment consisting of a pendant of peculiar shape, which maintains the load in per-fect equilibrium, and, at the same time, enables it to pass the supporting pulleys with ease. Each of these boxes carries 1cwt. of stone, and the delivery is at the rate of about 200 boxes or 10 tons per hour for the threemile distance. In the case of lines for heavy traffic, where a series of loads, necessarily not less than 5cwt. to 10cwt. each, must be carried, a pair of stationary supporting ropes, with an endless running rope for the motive power, will be employed, but the method of supporting, and the peculiar advantage of crossing almost any nature of country with a goods line without much more engineering work than is necessary for fixing an electric telegraph, without bridges, without embankments, and without masonry, exists equally in both branches of the system. The model admirably illustrated the system and its value as affording a cheap and continuous line of communication.

In railway matters, we have models of Mr. Price Williams' railway switches and crossings. The leading features of Mr. Williams' switch are as follows:-When the main line is open, and the switch is closed against the siding, there are no facing points. This alone would suffice to show the value of the invention to all who have the care of the traffic on through lines of railway, where the danger of facing points is so manifest. To do away of facing points is so manifest. To do away with this danger is the main object of the invention. By means of an ingenious arrangement of sliding fish plates, the switch rails are fished up in every position, whether they are set for the main line or the siding. This arrangement ensures the accurate fit of the rails, and renders any shifting almost impossible. The switch is twisted into place. i.e., the joints about which the two rails of the switch turn are at opposite ends of the switch. The rails are all butt-jointed, and there are no tapered points. Thus the durability of the switch is provided for. It will thus be seen that for shifting the switch, three separate operations are necessary -first,

the rails must be unfished; next, the switch rails must be thrown over into position; and, thirdly, the rails must be fished up again in their new position. All this is done at one lever in the most complete manner by a very simple arrangement of rods and bell cranks. A short semaphore signal, similar to an ordinary facing point signal, is worked by the switch lever, and indicates that all is in proper adjustment. Had Mr. Williams confined himself to what is strictly necessary for working the switch, a gap would be left in the main line when the switch is set for the siding. Thus an engine or truck on the main line might, through carelessness or accident, run off the line at this gap. To meet this difficulty, a simple addition to the switch, in the shape of two short inclined pieces of rail, has been made. Any truck on the main line will then mount upon the switch rails by means of the short inclined pieces, and pass over them, as in a "drop crossing," such as is sometimes used in temporary tramroads. Thus the truck remains on the line, and no accident occurs. It must be remembered that the above arrangement can only come into play in the event of some negligence on the part of the pointsman, and is an indication of the care which the inventor has used in providing for all possible contingencies. Mr. Williams' crossings will be found described and illus-

trated on another page.

We next come to a working model of Mr. Charles Lea's gates for level crossings. model exhibited a recently patented improvement of an apparatus—originally patented some years ago by Mr. Lea—for the safe working of gates at railway crossings. The gates can be opened by the movement of a hand lever, which is connected with distance signals, and also with signals adjoining the crossing. By throwing the lever over, danger signals are raised, the gates unlocked and closed across the railway. The reverse operation frees the line and again locks the gates upon the high road. As it is impossible for the gates to be opened without the signals being simultaneously raised, and as the latter cannot be released until the gates are again closed and locked, perfect safety is ensured at the crossing. We are informed that gates upon this principle have been adopted on crossings on the London and North-Western Railway and on the Midland and other railways. Rapier exhibited a wrought-iron signal post, 70ft. high, as arranged when packed for transport. It occupies but a small space, being only about 12ft. in length by 10in. across. In this structure, iron tubes are used in groups of three, and are connected together by cast-iron triangular pieces. were various models of improvements in permanent way, by Mr. Ashcroft, Mr. Gregory, and Mr. Livesey. Mr. Rapier also exhibited models of his continuous railway crossings, with Mr. Price Williams' grooved rail applied to them. One system illustrated was that applicable to roads laid with cast-iron sleepers, the other being adapted to our home lines. Mr. E. Barnes sent an illustra-tion of a method proposed by him for coupling the vertical and horizontal wheels of locomotives used on the Mont Cenis Railway. He constructs the engines with outside cylinders, and places between the two axles, and some-what above the level of the latter, a cross shaft, provided at its ends with cranks, which are coupled by rods to the cranks of one of the pairs of vertical wheels. From this cross shaft the vertical shafts carrying the horizontal gripping wheels are driven by means of spiral gearing, the pair of horizontal wheels on each side of the mid rail being coupled by cranks and coupling rods. Mr. A. Alexander exhibited a model of another arrangement of locomotive for working a mid rail line. In this plan, the centre rail is gripped laterally between the peripheries of several pairs of vertical wheels carried by

engine. The cross shafts are coupled in the ordinary manner to the axles of the carrying wheels. Mr. T. Claxton Fidler sent a model of his articulated rolling stock, in which the axles are all truly radiated to the curve traversed, whatever its radius. The carriage has a pair of independent frames carried on three pairs of wheels, the arrangement being exceedingly well adapted for very sharp

Mr. R. F. Fairlie sent a model of his steam train bogie carriage, for working light and branch railways, or limited express trains on main lines. A carriage on this principle is now in course of construction, and is to be worked on one of our metropolitan lines. We trust Mr. Fairlie will there have an opportunity of proving practically that economy of railway working of which he has been so untiring an advocate. Mr. Fairlie's system is also applicable to street tramways, the steam carriages being similarly constructed, except with regard to the arrangements for taking up and setting down passengers. The carriage for roads stops to take up passengers like an ordinary omnibus, and does not emit smoke or steam in the usual way, the smoke being consumed and the steam condensed. The carriage for light railways has compartments with side doors to open on platforms, similar to those at present in use. The following are the general leading particulars of Mr. Fairlie's steam carriage:—Cylinder, 8in. diameter; stroke, 12in.; coupled driving wheels, 4ft. diameter; steam pressure in boiler, 150lb.; effective pressure on pistons. 100lb. per square inch; tractive power, 1,600lb.; diameter of trading bogie wheels, 30in.; extreme wheel base, 57ft.; clear width of carriage inside, 8ft.; total weight of steam carriage, with fuel and water for a 40 miles' run, 14 tons; accommodation for 90 passengers, weighing 6 tons. The steam carriage has ample power to take one additional light carriage, specially constructed to accominodate 100 passengers, or two light carriages with 50 passengers in each, at an average speed of 30 miles per hour, up gradients not exceeding 1 in 60, and with a consumption of coke less than one-third of the ordinary passenger locomotives now in use. The maximum weight in the driving wheels is reduced to 21 tons per wheel, instead of 5 to 8 tons on a wheel, as now ordinarily in use, thus effecting great economy in the main-tenance of way and wear and tear of rails. From the extreme length of wheel base the steam carriage will be remarkably steady at high speeds, when running in the straight line; and by the arrangement of the double bogies can pass round curves of the smallest radii now in use with great precision and steadiness, and at the termini can be turned slowly on a semicircle of 60ft. in diameter. For the purpose of repairs, auxiliary or supplementary wheels are provided, which may be lowered on to the rails when the steam bogie is detached from the carriage, which can be done in a few minutes. The guard and engine driver are in close communication, and a platform with hand rail round the sides of the carriage, or, in the case of saloon carriages, a passage down the middle is provided to enable the former to communicate with the passengers when necessary This carriage while the train is in motion. is, in fact, a complete train in a condensed form. Its cost will be about one-third of an ordinary train of same capacity, while it possesses the important advantage of half the whole weight being made available for

adhesion on the rails or tractive power.

We next notice Mr. Scott's excellent wheel-moulding machine, which, during the past three years, has proved a great success. This success is attributable to the advantages embodied in the machine superseding the old system of moulding wheels from entire wood

thod, and to remedy existing defects by mechanical contrivance. He thus reduces the enormous expense of sustaining cog wheel plant to an ordinary trade outlay. This object is attained by the following means:— A trammel of any desired radius revolves around a central axis; at the end of the trammel is a vertical slide to hold the segment of a wheel, capable of being raised and lowered; a dividing apparatus moves the trammel the required distances on the circumference, the whole being portable. This combination secures a true periphery, the mould of the tooth and space perfect in finish, the accurate relative position of the teeth, together producing the best wheels with greater correctness and economy than by making patterns or cutting wheels by machinery. We next come upon Mr. De Bergue's hot air cooking stove, which is constructed upon scientific principles, so as to produce, from the combination of a large quantity of common air mixed with a small quantity of gas, a perfectly pure and rarefied hot air, which, it is stated, will cook steaks or chops in from seven to nine minutes, and other meats in a proportionate time.

We were much pleased with the models of Captain Saunders patent safety springs for anchors, chains, harbour moorings, and other similar purposes. They consist of a series of discs of metal and india-rubber placed alternately, as in a buffer. About five years since, when it was considered necessary to make it imperative that all ships' cables should be tested by submitting them to strains which impaired their strength for after service, Captain Saunders, a practical seaman, invented this cable safety spring to attach to cables in heavy riding, and which may be applied or removed at pleasure. Finding great difficulty in getting it tried practically by the Admiralty, and seeing it was from that quarter the merchant service looked for a report, Captain Saunders was induced to transmit his plans, with diagrams, to Calcutta, soon after the great cyclone of October, 1864, swept over that port. The harbour authorities called a committee on the subject, and it was resolved to try the springs. Accordingly, forty were ordered to be tried on the port moorings, and some of smaller size were purchased for their light and pilot vessels. These were duly reported upon as highly satisfactory, and orders are now annually given for the springs. We regret to learn, however, that only a few of our shipowners have adopted them. The reason for their indifference is the old one-"My ship is insured, and Lloyds' rules do not require any supplementary tackling to help the cables." In other words, "We don't care to prevent them breaking." Experiments were tried last year at Sheerness, and we understand that a favourable report was forwarded to the Admiralty. The only result, however, has been an intimation to the inventor that these admirable means of safety are not at present required for the Royal Navy. In many instances, however, these appliances have proved invaluable to those private owners who have adopted them, as numerous certificates testify. The combination of the buffer with the stopper, as arranged by Captain Saunders, is of the first importance, as the spring is in operation when anchoring the ship, in riding, and in weighing. We certainly think the attention weighing. We certainly think the attention of our naval authorities ought to be given to these means of safety, for when every ship carries a pair of these springs we shall undoubtedly hear far less of parted cables, stranded ships, and the attendant loss of life

and property.

Mr. W. Austin sent an example of his system for effecting verbal communication in railway trains between guards and drivers. It merely requires a whistle at each end of gripped laterally between the peripheries of several pairs of vertical wheels carried by cross shafts, placed between the axles of the

coupling is on the bayonet joint principle, and is a most ingenious contrivance. It can be easily and instantly attached or detached by the fingers. This apparatus can be used on board ship to convey messages down from the mast head to the deck, or any part of the ship. The great advantage here would be in getting a clear message to descend, especially when blowing hard at sea. We understand that the system has been tried on board the "Great Eastern," but has not yet come so prominently before the public as such an invention should. Messrs. R. and J. Beck sent some very interesting apparatus illustrative of the application of photography to meteorological purposes. These were the thermograph and the barograph, as adopted by the Kew Committee. The first of these is used for recording the thermometric, and the latter the barometric, changes, by means of photography. Messrs. Beck also exhibited Beckley's self-recording anemometer, which is the standard established by the Board of Trade for comparison with other instruments. As we hope in our next to give our readers full particulars of these beautiful instru-ments, we shall not further describe them here. There were also a number of inventions exhibited which we do not now stay to particularize, as some have recently been described and illustrated in our columns, whilst special notices of others will be found in our present and next numbers. Amongst the former, we may mention Mr. Outridge's equilibrium slide valve, which is at work on the Cowes and Newport Railway; Mr. Waters' feed-water heater, described by us on the 14th ult.; Captain Albini's self-registering compass; Mr. Allen Ransome's feed motion for wood-working machinery; Mr. Rogers projectile anchor and carriage; Mr. Sax's alphabet telegraphs; Mr. Wither's insubmersible lifeboat; Mr. Brinsmead's pianoforte repeater action, &c, &c., &c.
Mr. Whitworth exhibited cross sections of

his 9-inch gun and polygonal projectile, illustrative of his system of windage. He also had cross sections of a 9-inch gun and a studded projectile, showing the windage, the specialities of all of which were explained by Mr. Whitworth with that clearness which adds such value to all his statements. We must not forget to notice the beautiful models, lent by Messrs. Maudslay and Field, of their regular type of oscillating paddle engines, and of the engines of the "Agincourt," 1,350-horse power. Messrs. Miller and Ravenhill, and Messrs. Penn, sent not less beautiful models of the engines of the Irish mail boats, "Leinster" and "Connaught," and of the engines of H.M.S. "Northumberland" and "Minotaur." These gems of modelling art were kept in motion by an arrangement of shafting devised by Mr. Jabez James, and which was driven by the gas engine used for ventilating the hall and which gave a marked feature to the conversazione. Mr. James himself exhibited a model of a pumping engine, and an engine counter. Another attraction in the room was a letter stamper, designed by Mr. Pearson Hill, and in use at the General and provincial post offices. With this machine, an attendant effaced two hundred envelopes. per minute. The apparatus is highly ingenious, being self-inking, and so arranged as to enable the operator to work with ease as well as rapidity. It will stamp from two dies at the same time, one of which effaces the postage stamp whilst the other marks the date on the letter. Colonel Clarke, R.E., sept a model of Haulbowline Yard extension, a model of a caisson for the basin entrance at Haulbowline, and a model of the caisson for dock in French Creek at Malta. The details of this latter work were designed by Mr. W. T. Carrington, C.E. The caisson is 81ft. 6in. long above water line, 12ft. 4in. wide, and 38ft. high from bottom on sliding

in place, forms a roadway between the two sides of the dock entrance, and is strong enough to allow vehicles to pass over with a 10-ton load. The caisson is arranged to go into a camber when the dock entrance is required to be open, and this camber is bridged over for a length of 52ft. by strong wrought-iron girders and oak planking. This bridge or covering is permanent, so that there can be no interruption to the traffic along that side of the dock. When the caisson is in place, the level of its deck must be the same as the level of bridge over the camber; and, therefore, before moving the caisson into the camber, the deck has to be lowered 2ft., and the railing laid flat upon it before moving the caisson.

We have now taken our readers with us over the collection of interesting models, &c., which were presented to view at the last conversazione of the Institution of Civil Engineers. Of course, we do not pretend to have noticed everything; we have, however, made a selection of those matters which were most prominent, most novel, or of most interest to our readers. It only remains to us to acknowledge the courtesy of the president, the secretary, and other officers of the Institution, and to thank them for a pleasant and instructive evening.

## NOTES ON OUR NAVY.

BY a recent Admiralty order, I perceive that governors are at last to be introduced in all twin screw gunboats. Why the engines of light draft ships with a single screw should be allowed to remain without such a necessary adjunct is beyond my power to explain. I can only attribute it to one fact, viz., men in power have so long run on in the same old-fashioned groove that they will not see the immense advantages which such an improvement confers. In former years, the far-famed "Himalaya" was constantly breaking some important part of her machinery, or flinging her propeller off, but since the governor was put on I am not aware that a single accident has occurred, and the engineer informed me that he felt no anxiety now in the heaviest weather. Often when running before a heavy gale have I watched the engineer on duty standing by the throttle valve for hours vainly essaying to control the racing of the valuable machine under his charge. "She will tear herself to pieces" a common remark at such a time, and if any one will take the trouble to compare the difference in the cost of repairs between equally matched ships, one being fitted with a governor and the other not, he will find the engineer's remark perfectly correct.

Slowly and painfully is machinery making its way in the navy. The absurd idea still prevails that its introduction would leave the crew of a man-of-war nothing to do. It will indeed be a grand triumph of engineering skill when such a day arrives. But no man need fear that such a state of things would lessen the demand for human labour, although a higher degree of intelligence and education on the part of naval officers will be absolutely necessary in order to direct the management of such an elaborate machine as a highly finished ship will be. Let no man deem that the day of good seamanship has passed away. So far from this being the case, I am of opinion that the demand for it is more imperative than before. In the battles of the old war, blunders escaped with impunity which would now cause the loss of a ship. It is, therefore, absurd to hear men say that the engineer and stoker will fight our future actions on the ocean. In an old "Times," I have read the speech of his Grace of Somerset on the seagoing capabilities of these boasted American monitors (my views have been published long since). I find that he is

posed deck is only 1ft. from the water, and that such vessels are rather desirable places of residence for our seamen than otherwise. Such a remark reminds me of the recipe for feeding the poor which emanated from another noble duke some twenty years since. Where he gathered this information from I cannot imagine, for if he is really desirous of acquiring a correct account of their behaviour in a seaway, I would refer him to the journal of one of the officers, published in the "Nautical Magazine," who, when crossing the North Sea, describes the feelings of the English pilot as he watched the green seas rolling overhead on the thick glass decklights. No doubt such vessels would be serviceable as coast defences, but they must be built of much stronger materials, and on very different lines to what they are at present, or they would succumb to a blow from the iron stem of an ordinary ocean mail steamer.

It is a misfortune for England that so many of her great undertakings in ship-building should be decided by men who have no real knowledge of the principles on which a ship is built. For example, we take a venerable admiral from his snug London club, and give him command of a fleet of new ships. For years probably he has not been to sea at all, or troubled his head about the changes which science has wrought in the interim. Hence, the reports are so conflicting and contradictory about any particular type of ship, that builders are at a loss to guess what is required. No ship has ever been so much praised and condemned as the "Bellerophon," and the consequence is that "Bellerophon," and the consequence is that the public are ignorant of her true character; and I may add that professional men have gleaned nothing from the published accounts of her trials except a harvest of doubts. The same may be said of the Indian troopships.
The "Army and Navy Gazette" spoke constantly of their high rate of speed, their exemption from rolling, and general seaworthiness; while another naval paper flatly contradicted these statements, and described their rolling in terms more applicable to ironclads than ordinary ships. Of one thing, however, we are certain, and that is that their mean speed is painfully low, averaging from eight to ten miles an hour only, a rate which would ruin the reputation of any great

steamship company.

I see by the papers that Admiral Hornby is about to commission the so-called flying squadron. Where are they to fly to? and, when they reach their destination, what can wooden ships, armed principally with smoothbore light guns, effect, supposing that an imperative demand for their services arises. I know that the bill for caulking alone will amount to no mean sum. It is true that such a squadron would be able to dictate laws to the maritime provinces of the republication. the maritime provinces of the republics of South America, or the islands of the eastern seas; but we should not disguise the fact that complications of a grave nature are at our doors. Not long since, a member in the House of Commons said-"In the event of a war with a great naval power, our wooden ships must seek safety in flight." Yet, in the face of this danger, we increase the risk and send a large portion of our force beyond the reach of the telegraph. I believe, however, that the first cruize of the flying squadron will be its last; the country must, therefore, be prepared to pay for experience on such an important arm of its defence.

NOTES ON RECENT SCIENTIFIC DIS-COVERIES AND THEIR PRACTICAL AP-PLICATIONS.

wide, and 38ft. high from bottom on sliding seen published long since). I find that he is of opinion that these ships are of the most dry upper deck or platform, when the caisson is and buoyant description, although their ex-

A MEANS OF COPYING MANUSCRIPTS MANY YEARS
AFTER THEY WERE WRITTEN—THE BYE AFFECTIONS OF COMPOSITORS.

on M. Chasles as genuine, and which, if genuine, deprive Newton of the honour of all his great discoveries. That they are forgeries, and not very clever forgeries, few men of distinction, even in France, have any doubt, although the motive of the forger is obviously to give Pascal the credit of having made most of Newton's discoveries. Some letters, which it is pretended were written by Milton, have also turned up, and were published in last month's "Fraser's Magazine." It was instantly shown that these last were undoubted forgeries, and the source of some of them was very clearly indicated. We refer to this matter only to mention that a means has been discovered of deciding upon the age of a document up, at all events. to a certain time, and now it can be easily determined whether these documents are recent forgeries. M. Carré, the discoverer of this process, seems to have experimented with manuscripts of various ages. According to the lapse of time since the manuscript was written, he obtained fainter and fainter copies until he came to a document, dated 1789, of which he could obtain no copy at all. It may be accepted as a proof of the good faith of M. Chasles (of which, indeed, we have no doubt), that as soon as he heard of the process, he offered some of his numerous letters to be submitted to the proof, and we hope soon to learn whether or not M. Carré has succeeded in obtaining copies. The process is of a very simple kind, and, to say the truth, we are not disposed to put much faith in it. It is, in fact, nothing more than the ordinary mode by the press, but in place of using simple water M. Carré wets the document to be copied with dilute hydrochloric acid. What changes take place in ink which prevent us from obtaining a copy of a letter more than eighty years old, it is impossible to say. But supposing that ink containing iron has been used—and such inks appear to have been employed in Europe even in the time of Pliny—it might be expected after the application of hydrochloric acid an impression of a document of any date could be procured, which would be brought out and blackened on the application of a solution of tannin. This is, however, beside the present question, and we shall wait with some impatience to know the results of M. Carré's experiments with the Pascal-Newton documents.

We have alluded once or twice to the invention, by Dr. Kohn, of Breslau, of mica spectacles, to protect the eyes from injury by solid bodies, and also—mica being a very bad conductor of heat—from the mischief done to the eye by prolonged expo-sure to heat rays. The same eminent oculist has investigated the condition of the eyes of a number of compositors, and has made one or two practical suggestions, which are worthy of notice. The predominant affection of the eye produced in compositors is short sightedness, which increases with the length of time the occupation is followed. Out of 132 compositors whose eyes were examined, 68, or 51.5 per cent. were short sighted, and of these 51 had begun the trade with good sight. The source of the artificial light with which they work seems to have some influence on the production of the diseased state. Thus, of compositors who worked with oil lamps, 66 per cent. were short sighted, while, of those who worked with gas, only 50 per cent. were affected—a satisfactory state of things, considering that in this country little but gas is employed. The temperature in the neighgas is employed. bourhood of the ey of the eyes, when oil was used, was about 72deg. Fah.; and when gas was employed, about 76deg. Fah. The higher temperature, in the case of gas, was, no doubt, owing to the employment of the naked flame; and one of Dr. Kohn's suggestions is that the flame shall always be surrounded with a glass, which would, of course, arrest much of the heat. This would involve the use of the circular burners, but this, in the end, would, we believe, be found quite as economical as the bat'swing and fish-tail now employed. Another suggestion is an arrangement of the shade, to throw light more on the case, and less on the eyes of the compositor; and, lastly, the disuse of small types, with shorter hours of labour! These are all excellent suggestions, and, we may add, that it will be short sighted policy if they are not all adopted.

"FLINT JACK," the archæological curiosity manufacturer, has again turned up. He has been discovered at a village in Yorkshire, driving a roaring trade in forged implements and weapons.

ATTACK UPON THE PATENT LAWS.

N interval of about seven years has elapsed A since the last serious attack was made upon the principle of the patent laws. In 1862, Sir William Armstrong, at a meeting of the British Association, boldly assailed the theory on which they rest, and endeavoured to prove that public inconvenience ensued from the recognition of property in ideas. He had been hampered, he said, in manufacturing guns, by the patent rights of people whose inventions he wished to combine with his own. Captain Blakely, the inventor whose rights had been particularly obnoxious to Sir William Armstrong, urged, in reply, that he had been quite willing to lease his patents for a reasonable consideration; but this argument was looked upon as irrelevant by the supporters of free trade in other people's ingenuity. The necessity of buying inventions which he wished to adopt hampered the manufacturer, and to him it appeared that this objection was fatal to the whole system. It is satisfactory for those who wish to preserve for inventors the natural reward accruing to them from their intelligence and labour, to find, from the debate which took place on Friday in the House of Commons, that the opponents of the patent laws have not advanced beyond the position taken up by their predecessors seven years ago. The general drift of the speeches delivered by Sir Roundell Palmer and Lord Stanley was, that the patent laws were an inconvenience—that if all private property in ideas were confiscated to the public the public would be greatly the gainers. The "Pall Mall Gazette" on Saturday evening declared that this was equivalent to saying that if private property in land were confiscated the public would get the benefit of the crops. This simile is perfect, and puts in the clearest light the impolicy as well as the injustice of the proposed confiscation. All writers who have gone to the root of this question agree in admitting that a man who has evolved out of his own mind a valuable thought is the possessor of that idea just as completely as a carpenter is the possessor of the box which he has made with his possessor of the box which he has made with his hands. If any other man wants to use it he should buy it from the owner, and to take it away from him without giving him anything in return is simply an act of spoliation. But it is evident, on the other hand, that a practical inconvenience would ensue to the public if the inventor's ownership in the idea were prevental. Beyond this which the idea were perpetual. Beyond this, which would not in itself be a justification for depriving him of it, it is possible that some one else would have devised it sooner or later if the first inventor had not. Can it be right, therefore, that the public should be deprived of an inheritance to which it might have succeeded in any case, after the lapse of a few years, by an exaggerated respect for the rights of an individual? Manifestly not. A com-promise is therefore effected between the claims of private property and the convenience of the public. The original inventor is secured for a limited period in the enjoyment of the profit to be made out of his idea, and after this period has expired, his invention becomes the common property of all. A patent right is simply the name given to this admirable compromise, and the moral principle on which it rests can only be assailed by those who are prepared to deny the existence of all individual rights whatever. In defence of the principle involved in the patent

In defence of the principle involved in the patent law, it may be useful to quote the opinions of John Political Economy, he says, while objecting to monopolies in general:—"The condemnation of monopolies ought not to extend to patents.

This is not making the commodity dear for his benefit, put merely postponing a part of the increased cheapness which the public owe to the inventor, in order to compensate him for the service. That he ought to be both compensated and rewarded for it will not be denied, and also that if all were at once allowed to avail themselves of his ingenuity, without having shared the labour or the expenses which he had to incur in bringing his ideas into a practical shape, either such expense and labour would be undergone by nobody, except very opulent and very public-spirited persons, or the State must put a value on the services rendered by an inventor, and make him a pecuniary grant. This has been done in some instances, and may be done without inconvenience, in cases of very conspicuous public benefit; but in general, an exclusive privilege of temporary duration is preferable, because it leaves nothing to any one's discretion." The latter part of this passage deals with something more than the principle involved, and points out the way in which

the patent law indirectly promotes the welfare of that very public in whose interest it is proposed to sweep away the private rights of all inventors. Very of those inventions from which the public derives important advantages spring in complete maturity from the inventor's brain. It would be nearer the truth to say, that inventing is a business on which certain people enter, knowing that though the property which they hope to create, by the devotion of their time and capital to its pursuit, will, if they succeed in creating it, be of an exceedingly subtle and intangible nature, still, in a highly civilized state of society, like our own, they will be protected in its enjoyment, just as completely as if it were coal or iron dug out of the ground. If the strange sophistries on this subject were allowed to prevail, and if the patent laws were abolished, the obvious result would be that the progress of mechanical invention would at once be checked. Inventors, who are not themselves manufacturers, who are simply working out their ideas in order that they may ultimately sell their patent rights, would at once abandon the labour from which they could never hope to obtain a reward. Manufacturers who might invent new and useful processes would endeavour to guard themselves by a clumsy and artificial system of secrecy. If their inventions were of a nature which could not be concealed, the wealthiest manufacturers in their line of business would at once pounce on their ideas and absorb the lion's share of the profit. Other inventors, flying from a country, which, as far as their peculiar interests were concerned, would would be a land without laws, bring out their inventions under the protection of some foreign government, by which the rights of individuals were not tenderly treated, and Great Britain would lag behind all other states in mechanical and scientific progress.

It would be a work of time to follow Sir Roundell Palmer through each of his illustrations of the in-convenience ensuing to manufacturers from the necessity of respecting patent rights. One fallacy however, pervades them all. No manufacturer can be hampered by any patent right which he does not want to infringe, and if he wants to infringe it, that is to say, to use and profit by another man's invention, why should he be allowed to do so without paying the proprietor, any more than he is allowed to use another man's house without paying him rent? Take the case of the millers. R. Palmer says millers used to be greatly troubled by the flour flying about from the stones. They tried all manner of devices, with fans, to create an indraught, but it always sucked in too much air or too little. At last, someone invented a plan of doing this in the right way, and the millers seem to adopted his plan without paying him any royalty, to a very considerable extent, for we are told "all the millers in the kingdom combined to go into litigation to defend themselves, and suits of enormous magnitude resulted simply from this, that a man had been allowed to step in and prevent the millers from doing their business in the best way." But where would there have been room for litigation unless they had stolen the patentee's idea? If they had hit upon the same idea before him, his patent would have been invalid, and if they took the idea from him what possible justifi-cation can there be for them in attempting to profit by his ingenuity without paying him anything in return? If a patentee should prove a dog in the manger, not allowing any one to make use of his invention, nor carrying it out himself for the benefit of the public, the law ought certainly to make him do the one or the other; but in practice a state of things like this is unknown. If a man cannot apply his invention himself, he is only too glad to find some one who will take it off his hands, and he only defeats himself if he puts an exorbitant valuation on his right. Nothing would be easier, moreover, than to amend the patent law if that were found desirable, with the view of compelling patentees to lease their rights to any manufacturer willing to pay a fair price; but the plain justice of such an arrangement throws light on the gross injustice which would be committed if the patent right were annihilated altogether. As for the magnitude and costliness of litigation concerning patents, that simply illustrates the value of the property at stake which it is now proposed to confiscate. It is, no doubt, true enough that the ordinary courts of law are very bad tribunals for patent cases, and the great cost of such proceedings is an immense evil, which ought to be abated; but to abate it by giving up all that species of property to which it relates to public plunder would be like simplifying titles to land by abolishing landlords. It is fundamentally

untrue to say that the patent right is simply defensible as a stimulus to invention—to describe it in this manner as an artificial temptation held out to ingenious persons with the view of inducing them to make discoveries for the public benefit. An idea may be just as completely the property of the man who conceives it as the watch he wears in his pocket, and it is only placed under the protection of a peculiar law because its peculiar character renders it impossible for the policeman who protects the watch to protect also the idea. That the same idea may sometimes be conceived almost at the same time by different men is perfectly true; but it does not become any more, perfectly true; but it does not become any more, on that account, the property of the public at large. It may be difficult to say which of the two men is the owner; but one of the two is the owner undoubtedly, and the law gives the ownership to the man who first takes out a patent. If any one can suggest a better system of settling these difficult cases let him do so. Those who know most about the patent law will be the last to say that it is beyond the reach of improvement; but the only persons who would benefit by its total the only persons who would benefit by its total the only persons who would benefit by its total destruction would be powerful manufacturers, who would then be enabled to rob poorer inventors with impunity, and beat them out of the field by the power of purse. It is greatly to the honour of Mr. Mundella, who belongs to the only class which would benefit even temporarily by the abolition of the patent law, that he generously repudiates the unjust proposal.—"Standard."

# THE ARTIFICIAL PRODUCTION OF ICE

THE ARTIFICIAL PRODUCTION OF ICE AND COLD.

(Concluded from page 390.)

RROM what has been stated, it will be apparent that at present the choice of a refrigerating agent for producing ice or great degrees of cold, lies between ammonia, ether, and air, and that ammonia presents the greatest advantages for this purpose. The expansion of compressed air appears to have been the means first adopted for making ice, by Dr. Gorrie, of America; and in this country, ether was the material employed in one of the earliest ice-making machines invented by Harrison, in 1856. This was a very simple, but rather crude arrangement, represented by fig. 1, and consisting essentially of an air-pump C, connected with an evaporating vessel or refrigerator A on one side, and with a condenser on the opposite side, so that, by the action of the pump, ether was continuously vapourized in the refrigerator, while, at the same time, the vapour formed was withdrawn and forced into the condenser, where it was liquefied, and then returned to the

other was continuously vapourized in the refrigerator, while, at the same time, the vapour formed was withdrawn and forced into the condenser, where it was liquefied, and then returned to the refrigerator by a lateral pipe furnished with a valve. The fundamental principles on which this apparatus was constructed were correct, but there appear to have been several serious errors made in their application, and the plan did not come into use in this country. The ethermachine was afterwards improved by Messrs. Siebe, in 1862, and they have since applied themselves specially to the manufacture of these ice machines. Most of those which have been made were for India and other hot climates, where it has been found more advantageous to make ice by artificial refrigeration than to import it from America, owing to the large amount of waste by melting during the voyage through warm latitudes.

In the year 1860, another apparatus was invented by M. Carre, of Paris, in which a very strong solution of ammonia was used as the refrigerating agent. The arrangements of this apparatus provided for the condensation of the ammonia vapourized in the refrigerator, in such a way, that it was used over and over again, and the operation of the apparatus was continuous, as in the case of the ether machine. The woodcut, fig. 2, represents this apparatus. A strong vertical boiler Ais charged with a concentrated solution of ammonia, to which heat is applied, under a pressure of eight or nine atmospheres—100lb. to 1351b. per square inch—and the mixture of gaseous ammonia and steam produced passes off through an ascending coil of pipe B, attached to the upper end of the boiler, into a tubular condenser D, surrounded by cold water, where the distillate is cooled and liquefied under the pressure above stated. The condensed liquid collects in a receiver z, and thence passes by the pipe eee into the refrigerator F, at a rate which is regulated by a special contrivance.

The refrigerator F consists of a close vessel with tubes f, closed at the bot

#### PRODUCING COLD. MACHINES FOR

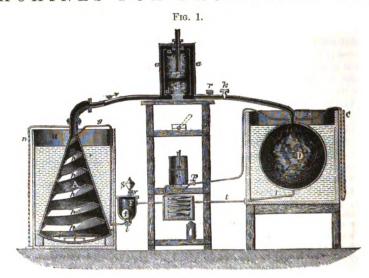
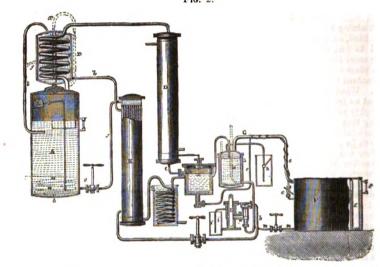
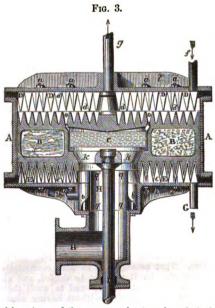


Fig. 2.





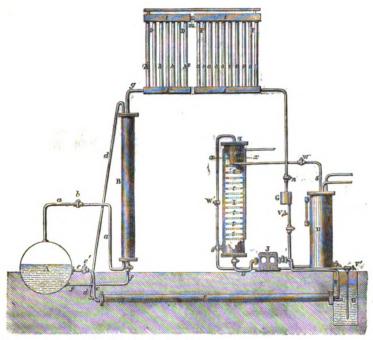
refrigerator, and the pressure kept so low that the liquid ammonia is vapourized continuously, thereby abstracting heat from the contents of the tubes f. The solution of ammonia produced in the absorber H is forced by the pump I through the pipe b into the outer casing of a tubular vessel K, called the regenerator, through the tubes of which hot water, exhausted of ammonia, flows in the opposite direction from the boiler A. Here an interchange of temperature takes place, the solution of ammonia becoming heated while the exhausted liquor is cooled. The solution of ammonia, thus heated, then passes on into the closed vessel above the boiler, and containing the coil B, where it is still further heated, while the gaseous ammonia and

steam within the coil B are partially cooled and condensed, and it then flows by the pipe b into the boiler A to serve for a repetition of the process.

The hot liquor exhausted of ammonia meanwhile flows from the boiler in a regulated current through the pipe J into the tubes of the regenerator K, thence through a cooling worm m surrounded by water, where its temperature is sufficiently reduced, and then passes into the absorber H, furnishing the supply of water for dissolving the ammonia as already described. This machine has been largely used in the south of France for effecting the crystallization of salts by cooling, and several have been sent out to India for making ice. In 1862, Mr. Kirke, of the Bathgate Chemical Works, invented a machine in which the alternate compression and expansion of air was applied as the means of refrigeration, on the in which the alternate compression and expansion of air was applied as the means of refrigeration, on the same principle as Stirling's air engine for obtaining motive power. This machine, which is represented by fig. 3, has been used in paraffin oil works for effecting the separation of solid paraffin from the oil; it has also been worked at Messrs. Flower's oil; it has also been worked at Messrs. Flower's brewery at Stratford-on-Avon, and one has been sent to China for making ice. The arrangement of the machine is very good; but, for making ice, it is expensive, on account of the relatively large expenditure of power required. Messrs. Mort and Nicolle, of Sydney, in Australia, have quite recently patented another apparatus, in which the expansion of cold compressed air is proposed to be applied; but the principle on which it is based appears to be erroneous, and it is not likely to be effective for refrigeration, besides which their apparatus is far too complicated in its arrangements. Several other patents have been taken out for ice-making machines, but those already mentioned are the principal ones which have been tried.

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#### MACHINES FOR PRODUCING COLD.



of plates arranged one above the other inside. Into the top of this vessel a concentrated solution of ammonia is pumped continuously, and, in descending from plate to plate, it meets the ascending current of high-pressure steam, the effect of their contact being to convert the ammonia into gas, while the steam is condensed and flows back again to the boiler A. The gaseous ammonia passes out of the analyzer by the pipe g into a tubular rectifier D D, where the remaining steam is condensed and separated, while the ammonia passes on through a condenser F F, where it is liquefied, and then flows through the pipe c to the refrigerator H, the supply being regulated by a cock n.

Meanwhile, a regulated current of spent liquor passes from the boiler into a long tube C, called the heater, fitted with an internal set of tubes, through which the concentrated solution of ammonia is forced by the pump J into the top of the analyzer. By this means the solution of ammonia is heated, and, at the same time, the hot liquor from the boiler is sufficiently cooled to be supplied to the absorber I, into which it is forced by the pressure of the boiler, through the pipe x x, fitted with a cock w, to regulate the supply. In the absorber I, this water becomes saturated with gaseous ammonia discharged from the refrigerator H, and the resulting strong solution of ammonia is then pumped out into the analyzer. The important feature of this arrangement consists in the application of the analyzing column B, and the rectifier D D, by which it is intended that the dehydration of the ammonia should be carried so far that the condensed liquid passing into the refrigerator may be practically free from water, while, in Carre's apparatus, the liquid supplied to the refrigerator and only 75 per earl of water and only 75 per and 10 means and 10 m

far that the condensed liquid passing into the refrigerator may be practically free from water, while, in Carre's apparatus, the liquid supplied to the refrigerator contains 25 per cent. of water, and only 75 per cent. of actual ammonia.

The effect of this difference upon the working of the apparatus would be very great. Thus, for instance, the distillate passing from the boiler of Carre's apparatus is separated into 95 per cent. of a liquor containing 25 parts of ammonia—which, after being cooled, is used for supplying to the absorber—and 5 per cent. of a distillate consisting of 3-4ths ammonia and 1-4th water, which passes through the condenser without any further separation of the water. Therefore, only 3-4ths of the liquid supplied to the refrigerator is ammonia; and since water, at the temperature of from 22deg. to 40deg. Fah., which is produced in the refrigerator, is capable of dissolving and retaining in solution its own weight which is produced in the refrigerator, is capable of dissolving and retaining in solution its own weight of gaseous ammonia, only 2-3rds of the ammonia in the liquid supplied to the refrigerator will be available for refrigeration, the remaining third being retained by the water in that liquid, so that there will be a residuum of solution of ammonia, which must be run off from time to time from the refrigerator. Therefore, since the effective refrigeration in an apparatus capable of making 5cwt. of ice an hour from water at 60deg. Fah., must be equivalent to the vapourization of 106lb. of ammonia within that time, it would be requisite to produce in the condenser a distillate at the rate of 212lb. per hour, for of this quantity 53lb. will be water, and that water will retain 53lb. of ammonia in solution, leaving only 106lb. available for refrigeration. Then, since the cooled exhaust liquor, as introduced into the absorber, already contains 25 per cent. of

ammonia, it will dissolve only 1-20th of its weight ammonia, it will dissolve only 1-zoth of its weight more of ammonia; and consequently, to maintain the required rate of vapourization, it will be necessary to supply at the rate of 200 gallons exhaust liquor per hour to the absorber,\* and to pump nearly 1 ton of ammonia solution per hour into the boiler, against a pressure of ten atmospheres, which will require an expenditure of power to the extent of ½-horse power per hour.

an expenditure of power to the extent of ½-horse power per hour.

In the apparatus devised by Mr. Reece, on the contrary, it is proposed that the ammonia solution should be separated by the operation of the analyzer into 75 per cent. of liquor, containing five parts of ammonia, which is to return to the boilers, and into 25 per cent. of gaseous ammonia, which, after being completely dehydrated in the rectifier, is to be deligrated to the refrigerator, almost early why for free. completely denydrated in the rectiner, is to be de-livered to the refrigerator almost entirely free from water. In this case, therefore, 5-6ths of the ammonia distilled would be available for refrigera-tion, while, in Carre's apparatus, not more than 1-24th of it is available. Then, since the exhaust 1-24th of it is available. Then, since the exhaust liquor in Reece's apparatus would contain only 5 per cent. of ammonia instead of 25 per cent., as in Carre's apparatus, it would be capable of dissolving a further 20 per cent. Consequently, for the same amount of work, only 1-5th as much would be required as in Carre's apparatus, and there would be only 1-5th as much solution of ammonia to be pumped back into the analyzer. These are advantages of a very striking and important nature, and, if realized practically, they would offer for the first time an opportunity of utilizing to the fullest extent the great capabilities of ammonia as a refrigerating agent, in such a way as to surpass all others in efficiency.

agent, in such a way as to surpass all others in efficiency.

Little has hitherto been done in the application of artificial refrigeration to the making of ice in this country; but in hot climates, remote from natural sources of ice, it has been found to work very advantageously. Apart, however, from the actual production of ice, which, from our proximity to Norway, can be cheaply obtained thence in great abundance, there are many other purposes for which artificial refrigeration can be of great service. In preparing salt meat, for instance, a certain degree of cold is required to enable the meat to take the salt, and, in this case, the use of an apparatus capable of producing cold at pleasure would do away with the expense attending the transport and storing of large quantities of ice. Again, the influence of cold in preserving meat, fish, and other provisions, is sufficiently well established to justify the belief that artificial refrigeration might be applied with great advantage, not only in the transport of such materials for the context to the context to the materials for the context to the context to the context to the context to advantage, not only in the transport of such materials from the country to the metropolitan markets, so as to ensure their arrival in better condition, but also as a means of compensating that uncertain and variable relation between supply and demand which variable relation between supply and demand which sometimes renders articles of food excessively dear, and at others reduces their value to almost nothing. Large quantities of provisions are constantly being destroyed as unfit for food on account of damage during transport, or from being kept too long, and this might, in all probability, be prevented, if suitable means were applied to keep them cool while

\* See Report by Regnault, Balard, and Pouillet, "Comptes Rendus," 1862.

being brought to market, and to store surplus supplies at a sufficiently low temperature for their preservation. Enormous quantities of fish are at times destroyed or carted on the land for manure, times destroyed or carted on the land for manure, because, in the absence of any means of preserving an unusually large supply, it is not worth the cost of transport to market. In like manner, the importation of what may be called the waste meat of the Australian colonies, South America, and of other

portation of what may be called the waste meat of the Australian colonies, South America, and of other countries, appears to depend mainly on a practical solution of the problem, whether a sufficiently low temperature for preserving the meat fresh can be maintained during the passage to England, at such a cost as would afford a profit on the trade.

Another of the purposes to which artificial refrigeration may be applied with advantage is the brewing of beer, especially as the necessity for cooling power is of uncertain occurrence, and varies very much, according to the season, so that there is too great a risk in keeping a store of ice for the purpose, to admit of its being so much practised as might be desirable. It is, indeed, remarkable that so little has been done hitherto by brewers in applying artificial refrigeration, for with the exception of Messrs. Flower, of Stratford-on-Avon, who were the first to put up a machine for this purpose, and of Messrs. Truman, Hanbury, and Buxton, who have lately put up one of Siebe's ether machines at their brewery, there is, perhaps, no other brewery where browery, there is, perhaps, no other brewery where artificial refrigeration is practised.

The practical benefit of such a means of producing

artificial refrigeration is practised.

The practical benefit of such a means of producing cold at will, without incurring the expense arising from the waste of ice kept in store, has been well illustrated by the results obtained by Mr. King, the engineer to Messrs. Truman's brewery, during the autumn of last year. The apparatus worked there is capable of producing five tons of ice within the twenty-four hours, with a consumption of coal at the rate of ten tons per week, or about 7s. per ton of ice produced; and the additional cost corresponding to expenses for labour, waste of material, and interest on first outlay, would probably fall far short of the average price of ice during warm seasons, when it is most in demand, and sometimes rises as high as £2 per ton. But this is not the whole of the advantage capable of being realized in such a case by applying artificial refrigeration. In many cases it is by no means necessary for the object in view to produce ice, and in fact, there may be a very great advantage gained by not doing so. Thus, for instance, Mr. King has, by an ingenious contrivance, arranged the working of his apparatus in such a manner that the refrigeration is applied directly to the material to be cooled, without making ice or using any refrigerating medium; and by this means he has succeeded, with the apparatus just referred to as capable of producing five tons of ice in twenty-tour hours, in obtaining, during the same time and with the same consumption of fuel, an effect equivalent to the production of no less than fourteen tons four hours, in obtaining, during the same time and with the same consumption of fuel, an effect equivalent to the production of no less than fourteen tons of ice. This reduces the cost of the work done very considerably below the estimate already given, and the fact serves well to show what great benefit may be derived from the judicious application of refrigerating apparatus. rating apparatus.

rating apparatus.

Among other purposes to which it has been proposed to apply artificial refrigeration, is the cooling of the air in dwellings, and in passenger ships passing through tropical regions; and there are, no doubt, many other cases in which it might be usefully employed.

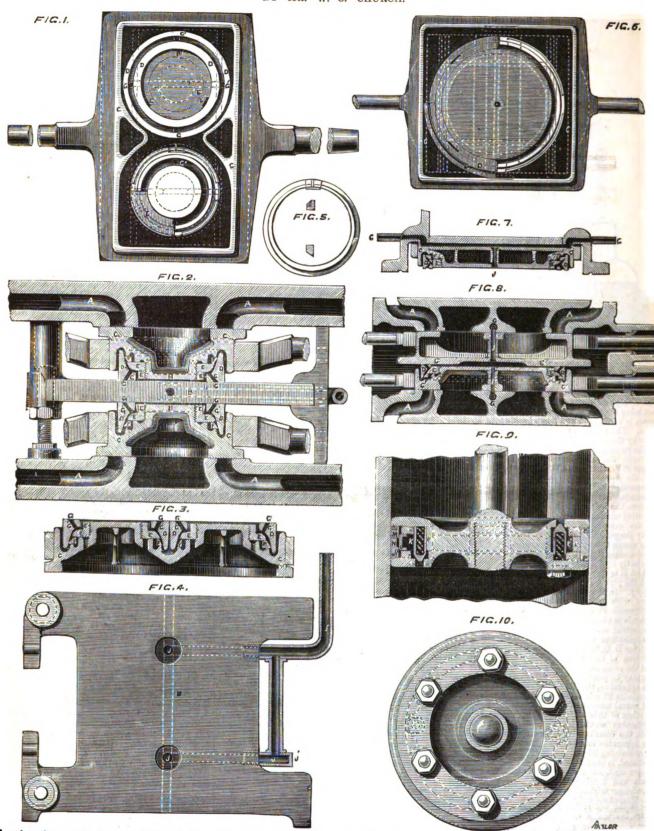
fully employed.

### CHURCH'S PATENT SLIDE VALVES AND PISTONS.

N our notice of the conversazione at the Insti-In our notice of the conversazione at the Institution of Civil Engineers we have briefly referred to the improvements which have been effected in slide valves by Mr. W. C. Church, of 2, Whitecross-place, Wilson-street, Finsbury, and 5, Church-street, Derby. This important subject demands special attention, and we therefore propose to place full particulars of this patented invention before our readers, illustrating the same by the annexed engravings. In these, fig. 1 is a plan or horizontal view of a slide valve constructed for the annexed engravings. In these, fig. 1 is a plan or horizontal view of a slide valve constructed for two caps or rings. One cap is shown in its proper position, and the other is removed, showing a quarter of the junk ring. Fig. 2 is a vertical section through the steam chest of a double cylinder engine, in which one steam chest supplies both cylinders with steam. Fig. 3 is a section at right angles to fig. 2. Fig. 4 represents detached the division plate, with the pipes for carrying off any leakage of steam between the back of the valve and the inside of the cap. Fig. 5 represents the metallic packing ring detached. Figs. 6, 7, and 8 show an arrangement of the valves for dispensing with the division plate in the steam chest, by making the two valves work back to back. A A are the steam ports, B is the division plate, C C are the slide valves, D D the caps or rings applied to the back of the slide valves, E E the junk rings, F F the metallic packing rings

#### PATENT SLIDE VALVES AND PISTONS.

BY MR. W. C. CHURCH.



for keeping the caps D D steam tight.

for keeping the caps D D steam tight. In describing the action of these improved valves, we must premise that the object of the cap is to prevent the steam in the steam chest from acting on that part of the back of the valve which is enclosed within the caps, or, more strictly speaking, that area which is represented by the line of contact between the caps and the metallic packing rings.

The cap is of a conical form, both internally and externally. The object of this form internally is to enable the metallic packing ring F to act as an expanding ring, in order to press the cap up to the division plate B (or the second valve) when the steam is shut off from the steam chest. The circular groove G and the holes G l in the cap D, and the holes E l in the junk ring E are intended

to carry off all steam that may leak between the surface of the cap D and the division plate B (or the second valve) at a part of the cap that will prevent the occurrence of a pressure to remove the cap from off its bearing face. When the steam is in the steam chest, the cap D is pressed up against its bearing face by the steam on the annular area, which is equal to the difference in diameter between the metallic packing ring F and the cap D. The caps D D are free to move on a fixed centre, at a point H, so as to compensate for unequal wear of the valves of the cap face, or for one side of the valve to lift in case of the engine priming. The metallic packing ring F is also arranged in such a manner as to be capable of accommodating itself

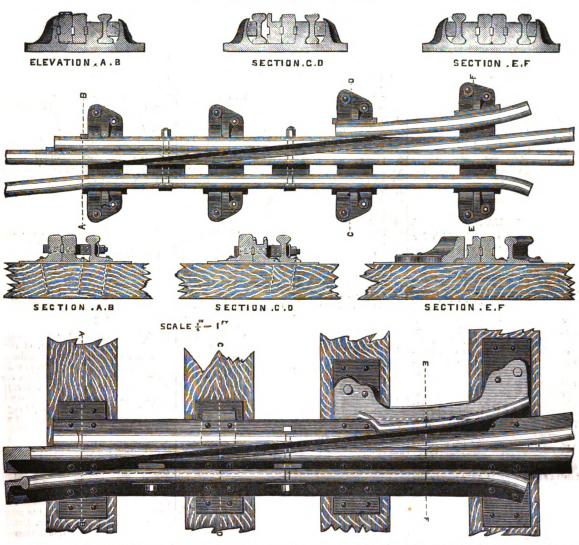
The ring is so arranged that the steam presses it both outwards against the cap D, and upwards against the junk ring E.

The metallic packing ring F is also made conical

on its outer circumference, for two reasons: first, in order to reduce the area of superficial contact between itself and the cap D; and, secondly, in order between itself and the cap D; and, secondly, in order to give the steam a larger area to act upon at the bottom of the ring; so that no amount of leakage on to the top of the same shall be able to place it in equilibrium, and thus destroy its required action. The holes, passages, and pipes J and J<sup>1</sup>, in connection with the division plate B, are intended for carrying off any steam that may accumulate for carrying off any steam that may accumulate in the cap D. The pipes  $J^{-1}$  are in communication manner as to be capable of accommodating itself to the varying position either of the cap or valve.

#### IMPROVED RAILWAY CROSSINGS.

MR. R. PRICE WILLIAMS. BY



so that in the event of any accident occurring to the caps D, these cocks can be closed. The effect of this will be merely to alter the action or condi-tion of working the valves, and reduce them to valves of the old construction. The division plate B is adjusted in position as required at the back end of the steam chest, by means of set screws, as shown in fig. 2, and at the front end by means of two brackets fixed to the steam chest lid, so that when the steam chest lid is removed, the valves can be withdrawn in the usual way without disturbing the division plate. Another mode of fixing the division plate is to slide it into a groove provided for it in the top and bottom of the steam

Figs. 6, 7, and 8 show an arrangement of the valves for dispensing with the division plate in the valves for dispensing with the division place in the steam chest, by making the two valves work back to back. In this case only one valve is required to have a cap on the back of it, the other having a plain surface for the cap to work against. Provision is made in these valves for allowing any steam that may accumulate in the cap D to pass out into the atmosphere, by means of the passages J and G in the centre bar of the exhaust ports and the centre bearing of the valves. The valves and ports are so arranged in figs. 7 and 8 as to reduce the steam ports in length as much as possible, and thus reduce the amount of steam used for charging the ports at each reciprocesting movement of the the ports at each reciprocating movement of the piston. The sides of the ports are extended in a circular form, in order to avoid the caps overhanging the faces of the ports at the end of their stroke.

We will now proceed to state a rule by which Mr. Church determines the area of the cap to be applied to the back of the valves. That portion of a slide valve which does not leave the face of the ports at the end of the stroke, less the area of the steam ports, represents the area on the back of the valve, upon which there is a constant pressure, varying only with the pressure of steam in the boiler. And as it is the object of Mr. Church's

improvements to remove this pressure, it becomes desirable to point out the following rule for determining the area of the back of any slide valve, from which the pressure may be removed, by the application of a cap as described.

Let A equal the area of that part of the valve that leaves the face at the end of the stroke.

Let C equal the total area of the steam ports.

Let D equal the area of the annular cap or ca for removing the pressure from the back of the

Then the formula will stand as follows:

Then the formula will stand as follows:—

A—(B+C)=D.

To take an example—Let a slide valve be supposed measuring 11½in. by 19in. The total area of the back of the valve would be equal to 213.75 square inches. The area of that part of the valve which leaves the port faces at the end of the stroke may be taken in this case as equal to 43.75 square inches. The total area of the two steam ports is equal to 49.50 square inches.

square inches.

Then 213.75—(43.75+49.50)= 120.50 square inches; which shows the area of the cap or caps to be applied to the backs of the valves, or, more strictly, the area to be contained within the circle described by the line of contact between the cap

or caps and the elastic metallic packing ring.

These valves can be applied to any description of engine at present in use, either stationary, marine, or locomotive, In this latter respect they have been used on the Great Northern Railway with satisfactory results, as will be seen from the following report of working from Mr. J. Budge:—

### GREAT NORTHERN RAILWAY.

Locomotive Department, King's Cross, May 25, 1869. Working of No. 257 Engine, with patent valves. April 30, 72 miles, shunting coal.

•	7	70	,	-
lay	1,	72	77	77
"	3,	72	"	71
"	4,	72		"
"	5,	$\begin{array}{c} 72 \\ 72 \end{array}$	"	11
"	7,	72	11	77

May 10, 154 miles Worked 8.5 a.m. to Peterborough. 9 on. Kept time.
Run empty Peterborough to Huntingdon. Worked 120 up passenger Huntingdon to King's Cross. Made up 12 minutes. 7 on Huntingdon to Hatfield. 16 on Hatfield to King's Cross.

Hatheid. 16 on Hatheid to King's Cross.

11, 154 , Worked 6.30 a.m. to Peterborough. Time made up 12 minutes. 16 on London to Hatfield. 15 on Hatfield to Huntingdon. 8 on Huntingdon. 8 on Huntingdon. don to Peterborough. Worked 3.35 p.m. from Peterborough to London. Made up 11 minutes. 20 on Peterborough to St. Neots. 21 on St. Neots to London.

TOTAL . 740

(Signed) J. Budge.

Besides the slide valves, Mr. Church has effected some improvements in pistons, which are illustrated in figs. 9 and 10, which are a section and underneath plan. K and K 1 are two small valves so arranged that one is in communication with the arranged that one is in communication with the steam on one side of the piston, and the other with that on the opposite side at each reciprocating movement of the piston. By means of these valves the steam is allowed to pass into an annular chamber enclosed by the ring L, thereby pressing against the inside of the ring, and forcing the packing rings M N and O outwards against the inside of the cylinder. Owing to the taper form of the rings N and O, they become pressed outwards laterally, as well as towards the inside of the laterally, as well as towards the inside of the cylinder.

The segments P P are for breaking joint in the packing rings M and O. It will be seen that the area of the ring L, upon the inside of which the steam acts, is much less than that of the bearing



surfaces of the packing rings M N and O; and it can be limited as desired just to keep the rings close against the inside of the cylinder and no more, by which means the wear and friction are reduced to a minimum. The small valves K and K 1 are so arranged as by their respective closing to prevent the escape of steam from the annular chamber in the piston as it leaves the cylinder at either end. The valves are also arranged so that the annular chamber may receive a fresh supply of steam from either side of the piston, in order to keep up a constant pressure on the packing rings during the whole time that the engine is at work instead of a merely intermittent pressure as usual in steam-packed engines. In some cases Mr. Church makes the ring L in two halves, in which case the junk ring G may be dispensed with, the construction of the piston thus being much simplified for small engines. Mr. Church has also patented some improvements in safety valves, the description of which we reserve for our next.

### PRICE WILLIAMS' RAILWAY CROSSINGS.

T would seem clear from the models which Mr. Price Williams exhibited at the late conversazione of the Institution of Civil Engineers, that railways, as at present constituted, are much open to improvements, in the matter, at least, of switches and crossings. In our general notice of the conversazione, we have given the leading features of the switch model, and do not dwell upon it further here than to remark that it is singular to find two such useful and novel inventions included under one patent. Both the crossings and switches are the design of a practical man, well acquainted with the deficiencies of the existing materials, and determined to rectify them; at all events, in such points as are more obviously defective. The long experience of Mr. Price Williams in the maintenance of permanent way has admirably qualified him for the post of inventor in this department, and now bears fruit in the improvements to which we refer, for the soundness of which the name of the inventor would be to many a sufficient guarantee. When it is considered that the number of inventions in the matter of permanent way is very great, and that these inventions in general deal only with very trifling details, it is satisfactory to notice improvements which deal with the main principle as well as with the details. This is the case with the inventions in question; and in the expectation that they will hereafter play a part in our railway system, which so nearly concerns the safety of all. we lose no time in placing before our readers the details of these crossings.

Before, however, proceeding to the description of the improvements themselves, it may be well to refer to the crossings most commonly found on railways, and the points in which they need improvement. Most of our readers are doubtless well acquainted with the solid cast-iron crossings, which have been widely employed. These are, theoretically, very perfect; the point is well defined and solidly united to the body of the crossing, and the whole crossing has a smooth and neat appearance, which go far in its favour when it is seen laid in the permanent way. But this crossing has very serious defects; that which is most complained of is the rigidity and want of elasticity in the large cast-iron block which composes the crossing. From this cause arises damage to the rolling stock and jolting to passengers. Another defect is the want of ready and convenient attachment to the rails, which is seriously felt in laying-in the crossings. The third defect is the brittleness of the point, which readily gives way to a sudden blow, and the crossing is then spoiled. Most of these defects are common to all solid crossings, and have led to a very general disuse of crossings of this form. The type of crossing most commonly adopted is the V-piece crossing. In this case, the main line rail and the siding rail are united at the point, and there terminate. The objection to this arrangement is that the point is not sufficiently supported and held down; consequently, the point is apt to get canted up and loosened, and by the frequent hammering action of the engines is then soon destroyed. It is true that special devices have been adopted in certain cases with more or less success, but their effect is only partial, and the best of these is far inferior in compactness to the crossing which we now describe, and which is illustrated in the annexed engraving.

The conspicuous feature in Mr. Price Williams crossings is the through rail for the main line. The

crossing is formed of two steel rails, one for the main line and one for the branch line. That for the main line is continued through the crossing, while that for the branch is brought up to the main line rail and bent alongside of it to the angle of the crossing. These two rails are firmly bolted together, and a slot is cut through both to the depth of 12in., to admit of the flange of an engine crossing the main line rail. This slot, it is to be noticed, does not disable the rails, which are rolled solid, and are only cut through to the extent of little more than one-fourth of their section. These two rails, with the adjacent guard rails, form the entire crossing, which is firmly bolted together and laid in the same manner as the other parts of the road, either in chairs or on sleepers, as the case may be. details of the arrangement may be easily gathered from the engraving. One of the figures represents a crossing as adapted to a double-headed rail, and a chair system similar to that used on the South-Eastern Railway. The other shows a crossing as adapted to a flat-bottomed rail, such as is used on the Metropolitan Railway. There is no difficulty in adapting it to any other description of permanent way, as, for instance, that where iron sleepers are used, and in this respect it will be very valuable in countries where timber is scarce and very

From the above description it will be seen that this crossing is free from the defects to which we have alluded in speaking of the crossings at present in use. The crossings here described is it should be, a continuation of the road. There is no abrupt change of material, nor of elasticity; the crossing is laid exactly as the rest of the road is laid, and would scarcely be noticed in passing over it. The continuous rails which compose the crossing are fished up to the adjacent rails in the road, and this fastening ensures the position and security of the crossing, while the point cannot fail to be sound, and is incapable of shifting in any direction. Thus the crossing fulfils the three great conditions of durability, elasticity, and ease of attachment to the road, combined with cheapness and general simplicity. Such a combination of useful qualities is valuable in the highest degree, and will, we doubt not, be speedily appreciated by practical men.

# THE ROYAL HORTICULTURAL SOCIETY.

THE great flower show of the season was opened the gardens of the Royal Horticultural Society, at South Kensington, on Wednesday last, the display being really magnificent. The new plants exhibited by Messrs. Veitch wore:—Duvallia Morei, Croton Veitchii, C. acubæplina, E. Hillianum, Begonia Sedeni, small leaved, with a delicato red flower; Masdevallia coccinea, M. Veitchiana, Iresine, Lindeni, Phormium Colensoi, Nepenthes rubra, the yew-like Retinospora filicoides, Darwinia fimbriata, Duvallia hemiptera, Dracana negro rubra, Thusia Bensonia. Those by Mr. B. S. Williams were Cochliostemon Jacobianum, Cymophyllum spectandrum, Epidendrum pentoles, Calamus ciliaris, Areca nobilis, Gesnoma Zamariensis, Araucaria elegans, A. Rulei, Ptoris serrulata corymbifera, Oncidium altissimum Cattleya citrina, Quercus concordia, Lælia pur-purata, Cypripedium barbatum superbum, and altissimum, and Lælia marginata (pale pink flowers), and Littonia modesta (orange yellow)—the last two the first time shown, and rewarded with first-class certi-ficates. There were also first-class certificates time shown, and rewarded with first-class certificates. There were also first-class certificates awarded to Messrs. Downie, Laird, and Laing, of Forest-hill, for Colous Saisonii (pink and white flowers), and a new double pelargonium, with very bright scarlet flowers, called "Victor Lemoine;" to Mr. Turner, of Slough, for the following pelargonia:—"Bright Star," scarlet; "Marmoin," scarlet, round crisp flowers; "Lady Carrington," sea pink and white very delicate. "Marmoin," scarlet, round crisp flowers; "Lady Carrington," pale pink and white, very delicate; "Corsair," deep red large flowers; "Maid of Honour," magnificent flowers, more than 23in, in disputator in colour flowers. in diameter, in colour, strong pink and delicate red; "Pretender," madder and crimson; "Sulred; "Pretender," madder and crimson; "Sultana," madder and pink; "Her Majesty," beauround and well-formed, pink and red; arrior," scarlet and madder; "Holkar," deep tiful Warrior," "warrior," scarlet and madder; "Holkar," deep lake and pink; "Gratulation" of the same class of colour, but redder; "Bonnie Charlie," similar, but deeper in colour. An exquisite series of varieties of British ferns was contributed by Mr. Lowe, F.R.S., of Nottingham, and first-class certificates were awarded to him for the following: —Scolopendrium vulgare, varieties summum, Thompsonii ornamentum, Allokoton dividendum,

Killiston gloriosum, Ath varieties Rickettsiæ, kalon. Athyrium filix fomina,

Not less attractive than the flowers was the collection of fruit, which was very good, grapes, pineapples, strawborries, peaches, &c., presenting a very tempting appearance. Of course, the great attraction was the annual exhibition of rhododendrons, under the great tent (by Mr. Anthony Waterer, of Knap-hill, Woking), which always proves of fresh interest to the visitors. Mr. Waterer has been particularly successful in producing novelties in this magnificent flower, and there are a large number in the present collection, showing very decided improvements in form and colour upon any yet introduced. The monster tent, 300ft. long, 120ft. wide, 55ft. high, and covered with 40,000 square feet of canvas, is admirably adapted to show off the variety of colours to the best possible advantage; indeed, on a fine day, the view from the high ground at the entrance is one of the finest. It affords us much pleasure to announce that the Council of the Horticultural Society, on Wednesday, awarded Mr. Wateror the gold medal of the society. It is richly deserved, and the more so, on account of the generous feeling that has restrained that eminent practical florist from competing for any prizes. The show remains open for several days, and as the rhododendrons are not yet fully out in blossom, it will increase in beauty by the end of the week.

### BEVIS' FEATHERING SCREW.

MR. R. R. BEVIS, the managing engineer to Messrs. Laird Brothers, of Birkenhead, has patented an arrangement for feathering the screw propeller, which has just been practically tested in the "Kathleen," a yatch built for the Marquis of Downshire, by the above firm. Mr. Bevis had long seen that a screw of the ordinary kind, whether fixed or revolving, was a heavy drag against speed and handiness of sailing; and that a lifting screw was a somewhat complicated and costly piece of mechanism. He, therefore, worked out a method of feathering the blades in a fore and aft direction, which appears to have answered satisfactorily. The "Kathleen" is of the following dimensions:— Length between perpendiculars, 140ft.; width, 22ft.; tonnage, 326 tons; and is fitted with a pair of inverted cylinder surface condensing engines, of 60-horse power nominal, and has capacity for about 70 tons of coal in her bunkers. Draft of water 11ft. abaft and 8ft, forward. She is rigged as a fore and aft schooner, with a good spread of canvas. accommodation for the owners is arranged in a halfpoop, about 55ft. long, and there are also additional cabins forward, as well as state-rooms for the officers, and a good forecastle for the crew. On the occasion of the trial, she had a draught of water of 11ft, lin, aft and 8ft, lin, forward, with a displacement of 316 tons, and an area of section of 148ft. The speed obtained as the mean of runs at the measured mile was 11:27 knots, with an indicated power of 393-horse power, the number of revolutions being 121 per minute. Before making the trial at the measured mile, a short trial made under sail alone, with the blades of the screw feathered into a fore and aft line, the operation of feathering the blades occupying only three or four minutes, and afterwards with the blades fixed to a pitch of 104ft. It was found that with the screw feathered, the yacht not only had a speed of 13 to 2 knots more than with the screw fixed, but that she was more lively in coming round. It was thus shown that the drag of the screw not only affected the speed through the water, but prevented the ship working as satisfactorily as she did when the blades of the screw were feathered fore and aft. The gear for feathering the blades is well protected, being worked in the screw-shaft tunnel by a rod passing through the centre of the shaft, and the levers that move the blades are enclosed within the boss of the screw propeller.

THE distribution of prizes to the students of the medical department of King's College, took place on Wednesday afternoon. The Archbishop of Cauterbury presided, and there were present the Bishop of London, Dr. Jelf, and Dr. Barry, the members of the council, and a number of ladies and gentlemen. Barry tendered a hearty welcome to the Archbishop on his taking the chair, and said that his Grace was no stranger within the walls of the institution. Dr. Barry spoke very encouragingly of the progress which the students had made during the past year in secular as well as in religious knowledge.



# OFFICIAL TRIAL OF THE LIQUID FUEL PLATE FURNACE AT CHATHAM.

THE method of heating armour plates for bending by means of liquid fuel, as applied by Messrs. Dorsett and Blythe, in Chatham Dockyard, and the successful results of the experiments, are, doubtless, fresh in the minds of our readers. We, therefore, without further comment, append a tabulated statement of the results obtained during an official trial, on the 26th ult., of the Dorsett system against the ordinary system of plate heating. These results will be found, on analysis, to be highly favourable to the liquid fuel system:—

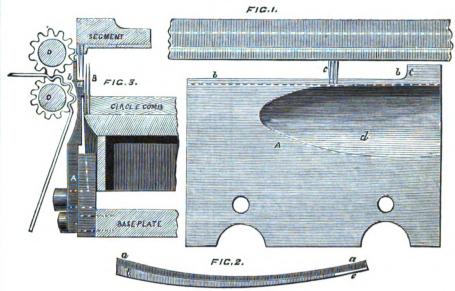
Experiments on Plate Heating by Liquid Fuel against coal, made at Chatham Dockyard, May 26, 1869:—

mad	le at Cha	than	n Doo	kyara	, May 26,	1869:-	
State of Plate when taken out.				down by its own weight.  About two-thirds of this plate were at an annealing heat; the part	next the grate only was suffi- ciently hot for bending.  Two-thirds of the plate were nearly white hot, while the other part	could not be nattened by nammer- ing.  This plate better heated than in ex- periment 4, but still unevenly	neacci, and not sunctently not for bending.  Altogether insufficient; an annealing heat only, and that very unequal.
Quantity of Ditto.	In heating the three plates,	Nos. 1, 2 and 3, 67 gals weigh-	ing 705lb., were used.*	19cwt.	3cwt.	19cwt.	12cwt.
Combus- tible used.	Creosote oil.			Hartley Main	coal.	2	2
Time Employed in Heating Plate.	h. min. 2 0	1 10	0 16	4 50	1 1	35	5 20
ime of rawing Plate.	a.m. 10-30	12.5	2.16	12.50	2.51	1.5	4.15
Time of Lighting or Putting in Plates.	8.30	10.55	2.0	8.0	p.m. 1.50	8.30	p.m. 1-25
State of Furnace Lighting T when put in. Plates.	Cold furnace and	Hot from the	" "	Cold furnace and cold plate	Hot from the preceding trial	Cold furnace and	Hot from the preceding trial
Dimensions of Plate.	7-8ft. by 3-6ft. by 6in.	9-44ft, by 3ft, 3in, by 6in.	plate 10ft, 10in, by 3.0ft, by 11in.	Same as in experiment No. 1 Cold furnace and cold plate	plate Same as in experiment No. 3 Hot from the	our Same as in experiments Nos. Coldfornace and 1 and 4	Same as in experiment No. 2 Hot from the preceding trial
Descrip- tion of Plate.	Armour	Armour	Keel plate	Armour	Keel plate	Armour	Armour
Grate Surface.	7 holes gin. diam.			16ft.	£	19ft.	:
No. of Grates.	-	:	ŗ	64	64	60	60
Dimensions of Furnace.	27.0ft by 5.0ft by 2.0ft high None	The same.	The same.	21.0ft. by 5.0ft. by 2.6ft. high	The same.	17-0ft. by 5-0ft. by 2ft. high	The same.
No. of Experi- ments.	,90.8i	rin's	m I IIO		13.COS.	Tull IsoC	

<sup>\*</sup> One cwt. of coal was used to heat the generator from which the vapour of the creosote was supplied.

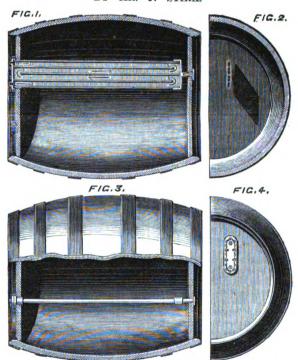
# WOOL COMBING MACHINERY.

BY MR. I. HOLDEN, M.P.



# ATTEMPERATOR FOR UNION CASKS.

BY MR. J. STIRK.



## IMPROVEMENTS IN COMBING WOOL.

MR. ISAAC HOLDEN, M.P., of Oakworth House, near Keighley, Yorkshire, has patented some improvements in apparatus for combing wool, in which are employed in connection with the carrying or holding combs other combs (which he calls "nacteur combs"), whose teeth point in the opposite direction to and during part of their motion overlap the carrying combs. His improvements also include the use with these combs, of a guard plate, formed with a projecting ledge in order that it may, whilst bearing against the carrying combs, give support or protection to the points of the nacteur combs during the drawing off of the fibre through the teeth of both combs. The plate extends in a direction from the tangential point of the carrying comb and the drawing-off rollers to the part of the carrying comb at which the long fibres begin to be drawn through the two combs by the drawing rollers, and also to some distance in the opposite direction. Part of it is also formed to act in cutting off or arresting the drawing off from the carrying combs of the longer fibres er top. This plate is also cut away in part to admit of the lower of the drawing-off rollers

In our engraving, fig. 1 is a front view, fig. 2 a plan or upper edge view, and fig. 3 an end view of a guard plate in position. A is the guard plate, B the carrying or holding combs, and C the nacteur combs. The guard plate A is formed with a projecting ledge a, adapted in working to give support to the teeth of the combs B, at the time of drawing off of fibre through the teeth of both of the combs B and C by the drawing rollers D. The projection b is that which affords protection to the points of the teeth of the nacteur combs C. The part c of the guard plate A is that which acts in cutting off or arresting the drawing off of the longer fibre or top. The part d of the guard plate A is cut away or recessed to admit of the lower of the drawing-off rollers D coming closer up to the main circle of teeth.

# STIRK'S ATTEMPERATOR FOR UNION CASKS.

MR. JOSEPH STIRK, the engineer to Messrs.

Alsopp and Co., at their new brewery, Burtonon-Trent, has invented a simple and efficient
attemperator for union casks, which is illustrated
in the annexed engraving, which we take from the
"Brewers' Journal." The apparatus is a flat copper



tube, in which partitions are inserted, through which a stream of water travels. Fig. 1 is a longitudinal and fig. 2 a transverse section of the apparatus; fig. 3 a cask in part section, showing an edge view being a cask in part section, snowing an eage view of the attemperator, and fig. 4 an outside end view. A stream of water entering at the inlet opening has to traverse the length of the tube four times, as shown by the arrows in fig. 1, before reaching the outlet. At each end of the tube is a brass casting; shown by the arrows in fig. 1, before reaching the outlet. At each end of the tube is a brass casting; one of these is provided with unions for attaching the inlet and outlet pipes, and the other has a socket which fits on a brass stud projecting from the opposite end of the cask, as seen at fig. 1. The head of the cask, through which the attemperator is inserted, is fitted with a brass casting, as shown in section at fig. 1, and in elevation at fig. 4. The attemperator is attached to this casting by six studs, the whole forming a compact and efficient arrangement.

#### AERONAUTICAL SOCIETY OF GREAT BRITAIN.

(Continued from page 385.)

DR. SMYTH wished to correct a mistake. Tt seems to be taken for granted that the muscles of the legs are stronger than all others. The power which those muscles are capable of exerting are really less. Muscles are stronger in proportion as they are stronger, and the muscles of the arms, when well developed, are immensely

strong.

Mr. Quartermaine said it might be important to observe that a pigeon will weigh about 11b. and have little more than a half square foot of surface. The weight of a bird is enough to propel it at a moderate velocity by three or four strokes per second, and driving it through 90ft. or 100ft. in the same time, so that a pigeon can fly 60 or 70 miles an hour without the use of more than the 250th part of a horse power per minute. That was, therefore, equivalent to more than forty times the power land. It should, however, be borne in mind that, with an equal additional weight to that of the bird, a pigeon would fail to fly at all. With a weight equal to their own, they would not be able to raise themselves from the ground more than momentarily. A horse would draw a load equal to his own weight at a much greater proportional velocity than a bird could do.

In reply to Mr. Kaufmann, the speaker said that one one-horse power in air would produce an effect equal to the expenditure of 40-horse power on land. Mr. J. M. Kaufmann, C.E., read a paper entitled

"A Few Remarks upon Aerial Transcursion":-Since the last occasion I had the pleasure of addressing you, considerable leisure has enabled me to arrive at certain conclusions materially altering the (at present) existing arrangement and power of my machines. By referring to these (photographs handed round), you will be better able to follow my subject. The only laws which we have imperatively to obey in flight may be condensed into the following:—

1. Power only to counteract gravitation.

- 2. All bodies must be heavier than air.

  3. Acceleration of fall should never commence.
- 4. The body must be propelled from every direction but one.
  - 5. All elevators must act as levers.
- 6. The greatest available surface shall be parallel with and the least perpendicularly to the direction of flight.

In place of the existing two wings and fourteen aeroplanes, it is now proposed to construct a machine with two propellers on each side, working at right angles, and separated by a set of superposed planes. To drive these propellers, I employ two cylinders 15in. diameter by 5ft. stroke high pressure, exhaust steam, condensed with injector. no gearings or pumps, wings feathered direct from the main shaft within the shell, a shifting crank in place of eccentric, and the shell made independent of the main frame. The bearing surfaces are thereby reduced to one-half the original. The boilers, which are constructed from the most approved designs, expose 5,000 square feet heating surface to the flame of the hydrocarbon surface, converting, on average, 18lb. of water per 1lb. fuel into steam. The engines and boilers are placed in separate cars. The proposed working pressure is from 50lb. to 120lb. per square inch. Taking 100lb. as the highest, and the piston surface at 176 square inches of the travel, at 1,000ft. per minute, the power indicated would be  $(176 \times 2) \frac{100 \cdot 1.000}{33.000} = 1,060$ -horse power. With,

proportion to speed, a powerful forward impetus is the result. The same also applies to the downstroke. On the other hand, it has been proved that the downstroke is an elevating and sustaining power, whilst the upstroke is really the most powerful propeller, counteracting any excess of an upward motion produced by the downstroke. This control must, of course, depend on the amount of angle given; in short, the downstroke must elevate and propel, and the upstroke must govern and propel. Employing one wing only, as in the bird, we are placed at a disadvantage, inasmuch as we expend an enormous power on each upstroke, which increases with the speed. For example, take each wing as 50ft. from the base to the exposing an effective minimum surface of 2000 square feet, weighing 250lb. each. The centre of gravity being 20ft. from the base, and the power 2ft. from the fulcrum, hence  $\frac{22\text{ft} \cdot 250}{23\cdot 1000} = \frac{22\cdot 1000}{23\cdot 1000}$ 33.000

× 2 = 26½-horse power, 160 representing the travelling feet. Such a dead loss must be saved, but this can only be accomplished in the manner already described, having the aeroplane fixed with sufficient clear space in such a manner that they recoive the double effect of the current of air forced and drawn aft. We now wish to find where we obtain the pressure necessary to raise the machine. Although this is meant to run along the ground and gain a momentum, yet it is on the instant of rising that the greatest strain is thrown upon the engine. Let us take the performance of each wing at 100 strokes per minute, and the load which each has to carry at 4,500lb., the greatest rise at 40ft. = 8,000ft. per minute; the amount of leverage here required is equal to 200lb., but this lever is of great width, and, therefore, the pressure on 2ft. square is equal to (8,000ft. per minute = 133ft. per second =  $\frac{133 \cdot 133}{440}$ ) 40lb. per square feet ×

4,000lb. leverage. But I find from experi-50ft. ments that the wing on passing the horizontal line in its descent indicates on 64 square inches the same pressure which was calculated on 1 square foot when stationary. If, therefore, we take the sustaining pressure on an average of 10lb., we should have 450 times 10 = 4,500lb. on each wing = 18,000lb.; the power of the lever is here not called into question. The acroplanes are 50ft. long by 5½ft. wide, in sets of three, exposing a surface of 3,300 square feet. Allowing the minimum pressure of 4lb. per square foot, would equal 13,200lb., giving the grand total of 31,200lb. = 14 tons sustaining power.

You will perhaps remark that this result is the very extreme. I am ready to meet your argument, and deduct 2-3rds of this results, and then I shall have 10,500lb. of sustaining power. The wings being balanced, I find that the power required to keep the machine in motion when once in the air is 18,000lb. raised 120ft. high per minute. But with one pair of wings, nearly double the power is required. On the other hand, to start immediately upwards from the ground, the following work has to be done,—18,000lb. raised 33ft. high per second. But to avoid this enormous strain, it is compulsory that the machine be made to attain a certain velocity on the earth before rising. The law of progress in the air is, I believe, as the length of the wing multiplied by the travel in feet per second, divided by the angle plus the resistance in each square feet. The engine, as calculated, is capable of towing ten carriages (each sustained by its own sustainers), with a full complement of water, fuel, passengers, and goods at a considerable speed.

My paper has now been long enough to wear out your patience. I will, therefore, conclude, firmly believing (if properly operated) in the impossibility

The Chairman said that he understood that Kaufmann intended to make a machine of working dimensions, though not of largest power, and he gathered from his concluding remarks that it could not fail. He could only say that he hoped Mr. Kaufmann was right in that conclusion; but he (the Chairman) was so old now that he could not believe anything unless he saw it. All he could say was, that he had some little confidence in Mr. Kaufmann; still, seeing is believing with an aerial machine.

Mr. Olrick remarked that for the power proposed this machine is to have a cylinder 15in. diameter and of 5ft. stroke, to make 200 revolutions a minute, and would require a steam presmost efficient boiler is that called the Field boiler, and it would take one of eight or ten tons. He must see the machine sustain so heavy a weight before he believed it.

Mr. Quatermain said he had tried experiments with steam, and he had given it up. They must have gunpowder or something else.

Mr. Kaufmann, in reply to Mr. Olrick, said his machine could lift 29,000lb. He asked how much

power Mr. Stringfellow's engine developed?

Mr. Brearey: 1-horse power, weight 1611b. Mr. Kaufmann saw that Mr. Olrick had taken it for granted that the machine would have to take water with it, or else it could not go. Now, he did not propose to waste steam, but to economise it by use of a new injector and a condenser. would not require to carry water in the machine, but would distribute it over the ten cars that accompanied the machine. The oil for fuel would also be distributed over the ten cars. The amount of water would be comparatively nothing to the weight of boiler.

Mr. Olrick would ask how the horse power of Mr. Stringfellow's engine at the Crystal Palace was measured? The engine was so small that an ordinary indicator could not be applied to measure it. With regard to the condenser mentioned by by Mr. Kaufmann, he had omitted one great stumbling block—he must have fresh cold water, or the condenser would not work. The figures he had given related to one hour's work. Of course, for a number of minutes there would be less in proportion, and he had only spoken of the lightest boilers he knew.

The Chairman said he was convinced that the practical remarks made would be thought well of by Mr. Kaufmann before he proceeded with making his machine. With their thanks, however, they would give him their best wishes.

(To be concluded in our next.)

# Megal Intelligence.

VICE-CHANCELLOR'S COURT. May 27.

(Before Vice-Chancellor SIR R. MALINS.)

PULVERMACHER v. HAMMOND. Mr. GLASSE, Q.C., and Mr. T. A. Roberts moved in this case to restrain the defendants, Charles Daniel Hammond and Alfred Burrows, otherwise Henry James, from an alleged infringement of the plaintiff's patent for electric belts and galvanic magneto-electric apparatus, &c., and from pirating the plainelectric apparatus, &c., and from pirating the plain-tiff's trade mark, consisting of the words "Electri-city is life," variously advertised, sometimes in blue clouds with gilt lightning surrounding it, on an illuminated sheet. The plaintiff, Isaac Louis Pulvermacher, alleged that he had for twenty-two years past devoted himself to the study of electricity, galvanism, and magnetism, for alleviating bodily ailments, and carried on business at 200 Regent-street, and in Paris; that he had invented certain means of applying electricity by voltaic chain batteries and flexible bands and belts, and from 1849 to 1861 applied for and obtained patents for the same. The bill referred to these patents, and that he had submitted his invention to Sir Charles Locock, Sir H. Holland, Sir W. Fergusson, Sir J. R. Martin, and Drs. Sieveking, Quain, Clark, and Jones, from whom he received testimonials; and letters from Sir J. R. Martin and Sir Charles Locock were produced. The plaintiff then alleged that his system and inventions had met with great success, and that the defendants had for some years past carried on business at 11, Charlotte-street, Bedfordsquare, otherwise called Percy-house, in order to make it appear that they practised at different places. The bill then set out advertisements issued by the plaintiff and defendants, in some of the latter, the words "Electricity is life, by means of the patent electric belts," commencing them, and Dr. Hammond was stated as the inventor and patentee of scientific inventions, and James was stated, in one of the pamphlets which they had published, to be the doctor's confidential assistant. The defendant Hammond had filed a provisional specification for improvements in apparatus for the relief of bodily ailments; but that had been determined, and it was clear that there was no patentee but the plaintiff. There were affidavits by Sir Charles Locock, Sir Ronald Martin, &c. An affidavit of the defen-(176×2)  $\frac{10071,000}{33,000} = 1,060$ -horse power. With, however, the usual pressure of 50lb, the proportion will be as 1-horse power to every 19lb, dead weight. In examining the action of the wing, we find that, if the upstroke be properly feathered in

This had not been objected to by the plaintiff. Dr.

Hammond was out of this jurisdiction.
Mr. Cotton, Q.C., and Mr. Graham Hastings appeared for the defendants.

At this stage of the motion.

Mr. Glasse, Q.C., admitted that on that evidence he could not insist upon the interlocutory injunction.

The Vice-Chancellor said he was very sorry that the public could not be protected; for poor people in this country, seeing these advertisements, thought they could get cured. He had a strong opinion against the defendants on their own affidavits. The motion must stand over till the hearing.

### COURT OF COMMON PLEAS.

June 1. (Sittings at Nisi Prius, in Middlesex, before Mr JUSTICE KEATING and a Common Jury.)

READ v. NORRIS.

THIS was an action to recover damages for injuries suffered in consequence of the explosion of a boiler.

Mr. Folkard appeared for the plaintiff, and Mr. Shaw and Mr. F. Turner for the defendant.

The plaintiff was a turner, and the defendant was the proprietor of a saw mill in the Waterlooroad. In August last the plaintiff rented of the defendant some steam power, and on October 30 the boiler burst and two men were killed. The plaintiff's arm was very severely scalded, so that he had been incapacitated from work almost down to the present time, and beyond this he had lost the best part of his tools. The plaintiff's case was that the boiler burst through the negligence of the defendant. That the boiler was one upwards of thirty years old, that it had been made for a low pressure boiler, but that it had been worked by the defendant up to a pressure of 55lb. and 60lb. pressure per square inch. Further, it was said that some of the fittings of the boiler were not such as they should have been, and that the defendant had been warned that if he worked at such a high pressure there would be an accident.

For the defendant this last statement was denied. It was said that the fittings of the boiler were good; and, further, that before the boiler came into defendant's possession it had frequently been worked at 60lb. pressure and upwards, and that this pressure it was well qualified to bear. The cause of the explosion was that the boiler was mended in August, and, contrary to the defendant's direction, the work was ill done, and that the plate used was not of good material. As to the amount of pressure indicated shortly before the accident, there was conflicting evidence. The evidence for the plaintiff was that the pressure was 58lb.; whilst that of the defendant was that it was 48lb.

The jury, after hearing a good deal of evidence expressed their opinion that there was no negli-gence on the part of the person who repaired the boiler; and they found a verdict for the plaintiff -damages, £80.

TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 is. 8d, yearly, or 10s. 10d. half-yearly payable in advance.

advance.
All literary communications should be addressed to the Editor of the MECHANICS MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday ovening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.
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SINE, at the rate of 6d. per line, or 5d. per line for 13 inser-tions, or 4d. per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate es type. Special arrangements made for large advertise

ments.

IF Mr. C. PEMBERTON, R.N., whose method of rifling smooth-bore guns we described and illustrated in the MECHANICS' MAGAZINE for the 14th May last, will send his address, we will forward him a letter which has been sent to our care.

RECHIVED.—T. D. S.—G. H. C.—W. R.—H. F. L.—T. A.
—E. W.—M. T.—G. and B.—G. W. H.—L. B. L.—R. J.—

F. and L.—H. B. S.—G. H. L.—F. R. P.—J. D.—R. T.—
M. and W.—H. B. and Co.—T. S.—R. N.—C. P. F.—P. W.
—W. A.—E. de R.—B. J.—T. and Co.—E. F. T.—H. B.—
T. L.—R. and J. B.—F. J.—B. H.—W. A.—F. T.—S. J.—
W. H. B.—J. C.—F. O. and Co.—J. R. M.

#### Meetings for the Beek.

-Royal Institution.—General Monthly Meeting, at

2 p.m.
WED.—Civil and Mechanical Engineers' Society.—Mr.
F. H. Roberts on "Steam Power and other
Hammers," at 8 p.m.
BAT.—Boyal Institution.—Mr. E. Deutsch on "Semitic
Oulture," at 3 p.m.

### Rabal, Military, and Gunnery Items

THE United States' Government has determined to change its coaling station for naval vessels in the West Indies from St. Thomas to Samana Bay, owing to the high charges for coal made by the authorities at the former place.

THE President of the United States has awarded gold watch to Captain James Brown, of the brig Arrow," of Brixham, in acknowledgment of the services rendered by him in rescuing the master and crew of the American ship "Yarmouth," of Maine, wrecked in the Bay of Biscay in the mouth of March

Mr. E. J. Reed, C.B., was presented to the Prince of Wales at the levee on Tuesday last, on being nominated a Companion of the Order of the Bath, by the First Lord of the Admiralty. The presentations at that levee were, by the Queen's pleasure, considered as equivalent to presentations to Her Majesty.

REAR-ADMIRAL ASTLEY COOPER KEY, C.B., F.R.S., who commanded in chief the Reserve Fleet during who commanded in cline the Reserve Freet during its recent cruise, has been selected by the Admiralty for the appointment of Admiral Superintendent of Portsmouth dockyard, as successor to Rear-Admiral George Greville Wellesley, C.B., who vacates the office, it is understood, for another appointment.

On Tuesday week, a drummer was examining a Snider rifle, belonging to one of the Grenadier Guards, in the infantry barracks at Windsor, and trying to fit it with one of the Henry-Martini cartridges, when the cartridge slid down the barrel, the muzzle of which was held downward. Newell elevated the muzzle to check the progress of the cartridge, and the latter slid back and exploded with the concussion against the breech. The bullet struck the ceiling and rebounded, wounding a soldier on the tenule. and rebounded, wounding a soldier on the temple.

and rebounded, wounding a soldier on the temple.

The church which was erected in Woolwich Dockyard, for the service of the Royal Navy and Royal Marines, has been transferred over to the War Department. A portion of the building is to be set apart for the crew of H.M.S. "Fisgard," Captain J. M. Jackson, bearing the flag of Commodore Superintendent Edmonstone, C.B. On the closing of the dockyard, it is said that the "Fisgard" will be retained at Woolwich, and used as a receiving ship, being moored in the river not very far from her present position.

sent position.

Mr. James Hall, the senior partner of the famous firm of Hall and Sons, shipbuilders, Aberdeen, died suddenly on Saturday morning, while aiding at the extinction of a fire in a neighbour's wood-yard. The deceased gentleman who was in his 65th year, was the 'author of the now celebrated "clipper" model for ships, and his firm have long held a proud supremacy for the beauty of build and sailing power of their vessels. It has been said, that there is not a port in the civilized world, where "Hall's clippers" are not known. By this death, Aberdeen loses one of the worthiest and most eminent of her sons, while in the wide circle of British commerce, Mr. Hall was esteemed for his business qualifications, and for being steemed for his business qualifications, and for being a thorough man of his word.

THE death is announced of Captain Scobell, of The death is announced of Captain Scoboll, of Kingwell, Somerset, and formerly M.P. for Bath. He was born in 1785, and entered the navy when only twelve years of age. He served at first on the coast of North America, and, subsequently, in the coast of North America, and, subsequently, in the expedition to Copenhagen, under Sir Hyde Parker and Lord Nelson, in the blockade of Cadiz, and in the Channel fleet. He was made lieutenant in 1804, and commander in 1812. In 1823, Captain Scobell invented and submitted to the Admiralty, a "dissecting paddle wheel," to be worked by winches applicable to men-of-war of every size. These wheels were fitted to the "Hecla" and "Fury," in Sir William Parry's expedition to the North Pole, and with only twenty men at the winches produced a with only twenty men at the winches produced a speed of a knot and a-half an hour.

on Monday last an interesting and important operation was performed on board the Bermuda floating dock at Sheerness. It was the careening of the dock by the admission of 5,000 tons of water into the chambers of the port side, by which an angle of inclination to the extent of 47deg. was obtained. It caused the keel of the dock to emerge obtained. It caused the keel of the dock to emerge several feet above the surface of the creek in which she is moored. The object in view was to remove from the bottom an accumulation of grass and small barnacles, as well as to effect some necessary repairs within two feet of her keel. The latter was the more important part of the work, as the Bermuda is the only floating dock capable of being repaired by her own appliances. The injection of the 5,000 tons of water was commenced at half-past 9 a.m., and finished at injection of the 5,000 tons of water was commenced at half-past 9 a.m., and finished at half-past 1 p.m.; the discharge occupying only two hours. The operation, as well as the necessary cleansing, was performed under the direction and superintendence of Mr. Barnaby, the Admiralty overseer; and as a proof of the extraordinary buoyancy of the dock, he states that an additional 2,000 tons could have been suspended on the submerged side without endangering its safety.

LLOYD's Statistical Committee have just issued their annual statement of the number of their annual statement of the number of shipwrecks and casualties reported during the year 1868, together with the average and comparative percentage of the two previous years. From these, it is satisfactory to observe the practical benefit now resulting from the operation of the Act of 1865, establishing compulsory proof of cables and anchors. It appears the average casualties arising from default of anchors and cables in 1866 and 1867 numbered 748, as against 417 only in 1868. In 1866 and 1867, the average annual loss of life is stated at 1,995, while in 1868 the total was reduced to 1.118. a saving of 877; and this, notor the 18 stated at 1,393, while in 1868 the total was reduced to 1,118, a saving of 877; and this, not-withstanding the unusually severe and tempestuous character of the weather, as evidenced by the greatly increased number of ships dismasted in 1868 over former vears.

former years.

LAST Wednesday the first sod for the new docks at Fleetwood was cut. Fleetwoed is quite a modern town, possessing good marine and railway facilities, but it has never made that headway which its founders anticipated, and one of the principal causes of its slow progress is said to have been its lack of dock accommodation. This defect, is, however, about to be remedied, and when actually removed it is confidently expected that its shipping trade will be greatly improved and that the town and district generally will be greatly benefited. The new docks will cost about £50,000. They will be 600ft long, 400ft, wide, and be 23ft, deep outside at high water during an ordinary spring tide. Mr. Cox is the engineer, and Mr. C. Chambers the contractor.

MESSES, CAIRD AND Co., of Greenock, have

MESSRS. CAIRD AND Co., of Greenock, have contracted to build a steamer of about 3,500 tons burden for the Peninsular and Oriental Steam Navigation Company. Messrs. Henderson, Colborn, and Co., of Renfrew, have launched an iron screw of 900 tons burden builders' measurement. Her engines 900 tons burdon builders' measurement. Her engines are supplied by the same firm, and are of 120-horse power nominal. The steamer, which has been named the "Helge," has been built for Danish owners. Mossrs. Aitken and Mansel, of Whiteinch, have launched the "Breadalbane," a screw of 1,300 tons register. The "Breadalbane" will be fitted with combined high and low pressure engines of 150-horse power nominal by Messrs. T. Aitken and Co., of Cranstonhill,

WE learn that the Admiralty have now offered, WE learn that the Admiralty have now offered, and the Ship Committee, acting on behalf of the Tay Training Ship Institution, after careful inspection, have accepted as a training ship for the Tay, the "Mars," now lying at Sheerness. This vessel is upwards of 2,570 tons register, and with only 250 tons of ballast she draws 20ft. of water. She was originally built as an 80-gun line-of-battle ship: She was then converted into a screw of 400-horse power, carrying 68 heavy guns. She has been lying in ordinary as one of the steam reserve for the last seven years, but has lately had her engines and in ordinary as one of the steam reserve for the last seven years, but has Intely had her engines and boilers taken out of her. She is reported to be a good sound ship, with her hull in good condition, but, in consequence of being so long out of commission, and not having masts or rigging of any kind, and many new fittings being required, a considerably larger sum of money than was at first suitigated larger sum of money than was at first anticipated larger sum of money than was at first anticipated will be needed for her equipment. As the original estimate of expense will be exceeded, it is hoped that subscriptions will flow in on a more extended scale, so that the committee may not be hampered by want of funds.

### Miscellanea.

THE Council of the Society of Arts have arranged for a conversazione at the South Kensington Museum, on Wednesday evening, June 23.

It is computed that the total number of persons annually employed in getting coal in Europe is 700,000. In Great Britain, 300,000; in Belgium and France, 120,000; in Prussia, 80,000, and the remaining 200,000 elsewhere.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending May 29, was 3,828. Total number since the opening of the Museum, free daily (May 12, 1858), 1.578.766.

FORTY mines in the White Pine (Nevada) district are named after General Grant, and nearly an equal number bear Sheridan's name in various forms. Morning Stars, Evening Stars, North Stars, and all sorts of fanciful appellations abound.

LARGE premises have been fitted up in Victoria for the manufacture of colonial safes, which are actually stated, by a colonial paper, to be superior to those of English make. There is a large demand for them in the colony, and it is said they can be made 20 per cent. cheaper than the English article.

THE celebrated clock at Strasbourg is said to be put into the shade by that now exhibiting in Paris for the Cathedral of Beauvais. To hide a defect in the United the inhabitants decided upon having a monster clock. They subscribed 40,000 francs, and for the last four years ten clockmakers and twenty assistants have been at work.



THE completion of the Central Pacific Railroad was celebrated characteristically at San Francisco. When the telegraph announced the last rail laid, the whistles of thirty locomotives, gaily decked, and drawn up in line, screeched out in concert as an expression of joy, and all the steam whistles in the city joined in city joined in.

An exhibition of Turkistan natural and industrial products was opened a short time ago at St. Petersburg, but contains little that is new beyond a tolerably complete collection of mineralogical specimens. country contains abundant coal fields, and has also iron, the quantity and quality of which does not seem as yet to have been sufficiently investigated.

THE members of the Society of Engineers will visit the Limehouse Basin Improvement Works, and the West India Docks Extension Works, on June 4, this day. They will meet at the Railway Station, Stepney, at half-past 11 o'clock. The visit to the Limehouse Works is fixed for 12 o'clock, and the visit to the West India Docks for 2 o'clock, p.m.

The village of Oldbury-on-Severn is proverbially noted for the size and excellence of its salmon, but for this season at present, and for a half century past, the palm must certainly be awarded to Mr. George Highnam, who this day week caught a monster salmon of the following extraordinary dimensions:—Length, 4ft. 8in.; girth, 2ft. in.; weight, 43lb. The fish was very bright in appearance, and capitally grown.

UP to May 31 there have been 69 applications for Up to May 31 there have been 69 applications for provisional protections for patents made in this country this year, for improvements in the bicycle or two-wheeled velocipedes. We are not in a position to prophecy how many of them will becompleted for the first term of three years, but we anticipate great work for the law courts to settle as to who did or who did not invent the so-called improvements. inventions must clash more or less with one another

THE number of visicors to the South Kensington THE number of visions to the South Kensington Museum during the week ending May 29, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 13,372; Meyrick and other galleries, 2,388; on Wednesday, Thursday, and Friday (admission 6d.) from 10 a.m. till 6 p.m., 2,285; Meyrick and other galleries, 179; total, 18,224. Average of corresponding week in former years, 13,871. Total from opening of Museum, 8,483,428. 8,483,428.

THE quantity of gold received by escort at the Sydney Mint from the gold-fields of New South Wales in the first two months of this year was 34,480z., as compared with 40,2230z., in the corresponding period of 1868, showing a decrease this year of 5,7750z. The decrease appears to be general, but the largest diminution has occurred in the returns from the southern districts; the effects of drought had been felt most severely.

A LARGE room has been discovered at Herculaneum which must have served for a kitchen. In it was a wooden clothes-press, entirely carbonized; also fourteen vases, a candelabrum and a lamp, all in bronze, several vessels in glass and terra-cotta; a small marble statue of a faun, and two broken tables, one in marble and the other in slate. These excavations are carried on by means of the grant of £1,200, by King Victor Emmanuel, made for that object.

NEAR Boston, on May 11, there was a race between a velocipedist on the "bicycle" and a trotting horse, the "John Stewart." The horse was to go 10 miles while the velocipedist rode 5. The latter won the race, completing his 5 miles in 26min. 20sec., while the horse trotted 10 miles in 26min. 35sec. The best mile for the velocipedist was done in 4min. 29sec., and for the horse in 2min. 27 sec.

THE usefulness of small birds as destroyers of insects is thoroughly recognized by the Saxon Government, as is shown by a curious scene witnessed last week on the market-place at Dresden. A body of police suddenly made their appearance, and, without any previous warning, seized all the cages containing singing birds exposed for sale and released their inmates. A decree has also been issued forbidding, under penalty of a fine, the killing or trapping of these useful songsters, and containing especially severe regulations with regard to birdnessing.

THE removal of the India Museum from Fife THE removal of the India Museum from Fifed house to the new India-office having been completed, after much labour and time, it is now re-opened for public inspection. The museum was founded in 1798 by Mr., afterwards Sir Charles, Wilkins, at the old East India-house, Leadenhall-street, and when that building was vacated, the collection of Indian manufactures and produce was removed to Fifehouse, and remained there until 1867, when the palace of the new India-office was finished.

THE New York Legislature at the Session just closed provided for the creation of a monster railway corporation, with a capital of 150,000,000 dollars, by the consolidation into one company of what are known as the "Vanderbilt roads," those owned and controlled by Cornelius Vanderbilt and his friends. These are the New York Central, the Hudson River

the Haslam Railway, the Buffalo and Erie, the Lake Shore, and the Michagan Southern, forming a leading route from New York to the West.

THERE is no other spoken language so cheap and THERE is no other spoken language so cheap and expressive by telegraph as the English. So the electric wires are becoming teachers of our mother tongue in foreign countries. The same amount of information can be transmitted in fewer English words than French, German, Italian, or any other European language. In Germany and Holland especially, it is coming to be a common thing to see telegrams in English to save expense and ensure precision.

The Academy of Sciences, after a careful examination of the question, has determined, by a majority of 53 to 1, that the Astronomical Observatory shall be removed from the site which it has so long occupied, at the end of the gardens of the Luxembourg, and placed within a large enclosed space of ground without, but near to the limits of the city, in order to secure the astronomers from the inconveniences caused by the neighbouring buildings, railways, roads, &c. The working of the observatory is to be entirely independent of the new one for meteorological observations, which is now being erected on Montrouge, but both will be under the direction of the Minister of Public Instruction. THE Academy of Sciences, after a careful examina

There are in Holland about 36 soap manufactories viz., two at Breda, each producing annually 10,000 kilos. of hard soap, and 200,000 of soft or green soap; four at Amsterdam, producing yearly 121,000 kilos. of hard and 1,000,000 kilos. of soft soap; one at Enkhinzen, producing 50,000 kilos. of soft soap; and one at Hoorn, producing 109,000 kilos. of soft soap. At Amsterdam there is a eandle factory which ships annually 12,000,000 of candles, 300,000 kilos. of oleine, and 60,000 kilos. of glycerine. It works night and day, employing 200 workmen, and makes only for shipment. It has four boilers and steam engines of 111-horse power, four distilling apparatus, and many hydraulic presses.

Dr. Richardson has been conducting a series of THERE are in Holland about 36 soap manufactories

Dr. Richardson has been conducting a series of experiments with the huge induction coil at the Polytechnic. He finds that the spark from the coil itself, which measures 29in, in length, has no injurious effect when directed against a living body. A pigeon was experimented upon, having been first put to sleep by bichloride of methylene. It was connected by the foot with the negative pole of the coil, and one or two discharges sent through the body. There was a general muscular contraction at coil, and one or two discharges sent through the body. There was a general muscular contraction at each discharge, but the heart's action and the respiration remained perfectly healthy. In fact, the bird was perfectly uninjured, save as to the feathers which, strange to say, were somewhat singed. A tond also passed the same course with satisfactory results. The escape of the animals in these cases is due to the ready course of the current over their bodies. In fact, the body internally is not traversed by the current at all, but is surrounded by it. by the current at all, but is surrounded by it.

# Patents for Jubentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chromologic al order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—3468, 3496
BUILDINGS AND BUILDING MATERIALS-

CHEMISTRY AND PHOTOGRAPHY-3484, 3515, 3516, 3527,

CHEMISTEY AND PHOTOGRAPHI—500, 3510, 3510, 3521, 3534
CULTIVATION OF THE SOIL, including agricultural implements and machines.—3487, 3506, 3510, 3526, 3536
ELECTRICAL APPARATUS—3490, 3501
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper, &c. —3466, 3447, 3476, 3480, 3481, 3499, 3503, 3504, 3513, 3521, 3522, 3530, 3537, 3538, 3542
FOOD AND BEVERAGRS, including the apparatus for preparing food for men and animals—3507
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c. —3474, 3483, 3494, 3520, 3529, 3530, 3540
GENERAL MACHINERY—3531, 3512, 3543
LIGHTING, HEATING, AND VENTILATING—3477, 3541
METALS, including apparatus for their manufacture—3471, 3482

METALS, in 3471, 3482

3471, 3482
MISCELLANEOUS—3470, 3486, 3416, 3488, 3489, 3492, 3497, 3498, 3500, 3502, 3505, 3514, 3517, 3528, 3533
BOADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—3469, 3472, 3522
SHIPS AND BOATS, including their fittings—3485, 3502
STEAM ENGINES—3479
WARRINGS—3473, 2478, 2478, 2478, 2405, 2606, 2616 Warfare—3478, 3475, 3478, 3495, 3506, 3512

8466 A. TURNER, Leicester. Elastic fabrics. Dated No-

The object is to weave the fabric in such a manner that the silk may be made to cover the cotton weft at the selvage of the fabric, and thus present the appearance of a

silk selvage instead of a cotton one, as heretofore. This is effected by drawing off a somewhat longer length of silk than of cotton weft, by causing the silk weft to pass round the selvage wire when it is raised higher or dropped lower than when the cotton weft thread passes round it.—Patent abandoned.

—Patent abandoned.

3467 W. RICHARDSON, Oldham. Carding engines. Dated November 14, 1868.

The inventor dispenses with the usual card or other roller used for dofflug, and applies a reciprocating comb in conjunction with a roller, grooved at right angles to its axis. This comb removes the material and delivers it to the grooved roller, which then retains it in separate slivers.—Patent completed.

slivers.—Patent completed.

3468 J. Howard and E. T. Bousfield, Tubular bollers.
Dated November 14, 1868.

This relates to a patent, dated February 8, 1868, No. 430, the objects being, first, to facilitate the removal from such boilers of the scum that is thrown up by the impure water employed in certain localities: secondly, to improve the connections between the vertical and horizontal tubes composing the boiler; and, thirdly, to facilitate the deachment and removal of any one or more of the vertical tubes when required.—Patent completed.

the ment and removal any one or more of the vertical tubes when required.—Patent completed.

3469 C. K. Bradford, Lynnfield, U.S.A. Felocipedes
Dated November 14, 1868.

This consists, first, in the employment of a compound crank shaft—that is, of a shaft composed of or provided with two or more cranks of different lengths, the larger of which is to be employed in ascending an inclined plane or grade, and when more power and less speed is desired; and the smaller to be brought into use when the vehicle is traversing a comparatively level and smooth plane and a greater rate of speed is desirable and a less amount of power is required. The invention further consists in a novel employment of a rope or chain for steering the vehicle, and its application directly, or nearly so, to the axis of revolution of the third or "steering" wheel of the vehicle, by means of which much more direct and powerful control is had over this wheel than would be the case were this power applied, as is now generally the case, at a greater or less distance from such axis.—Patent completed.

were this power applied, as is now generally the case, at a greater or less distance from such axis.—Patent completed.

3470 J. C. M'DONALD and J. CALVERLET, Croydon. Stereotype printing. Dated November 14, 1868.

The object of the first part of this invention is to facilitate the casting of semi-cylindrical stereotype plates, and refers to a former patent, dated December 6, 1866, No. 3222. The core is now formed with grooves around its circumference, and the mould arranged so that the core may be lifted out in a direction at right angles to its axis. The invention, secondly, relates to giving a continuous and even supply of ink to the inking rollers of printing machines. For this purpose, in place of transferring the supply of ink from the feeding roller (which revolves slowly in a trough containing the supply of ink to the first of the distributing rollers (which travel at the same surface speed as the type surface), by means of a roller vibrating to and fro, so as alternately to come into contact with the two rollers, as herotofore. Thirdly, to holding the roll of paper in that class of printing machines in which the paper is drawn continuously through the machine from a roll. The inventors fix the roll of paper on a spindle, which passes through the roll, and which is formed so that it may then be expanded and caused to fit tightly in the hole through the roll of paper. For this purpose the portion of the spindle which passes through the roll of paper is divided longitudinally into two wedge-formed pieces carry at their ends one of the axes upon which the spindle and roll are to rotate. When the two halves of the spindles have been introduced into the roll of paper, they are caused to separate one from the other by smaller wedges, which are embedded in recesses in the inclined faces of the two halves of the spindle heigh moved endwise by screwa, and so caused to stand up above the faces in which they were previously embedded.—Patent completed.

3471 H. Aitken, Falkirk, N.B. Treating tron ores. Dated Novembe

Dated November 14, 1868.
The iron ores or ironstones are placed in any convenient kind of retort, kiln, oven, or chamber, made as air-tight as possible, which may be placed vertically, horizontally, or at any angle, and a fire is placed so as to act in the retort, kiln, oven, or chamber, which is so constructed that no air is admitted without having first passed through the fire, so as to consume the oxygen that is in the air—Patent completed.

—Patent completed.

3472 J. H. Johnson, Lincoln's Inn. Railway wheels. (A communication). Dated November 14, 1868.

This consists in arranging strengthening ribs within the hollow rim, and in making the flanged side of the rim straight or nearly so, and at right angles or thereabouts, to the internal strengthening ribs above referred to, the objects of this part of the invention being, first, the affording facilities for easily casting the hollow rim with its internal ribs. The invention also consists in a cast-iron railway wheel, in which the nub and rim are connected together, partly by two concavo-convex plates, and partly by a single plate or web, forming a continuation of the said concavo-convex plates from the point where the two meet; also, of an annular rib made on the inner circumference of the rim, and forming a continuation towards the centre of the wheel of the flange, whereby greater strength is obtained. Strengthening ribs extend from the concavo-convex plates above referred to, and terminate at their outer ends, upon the annular rib before mentioned.—Patent completed.

3473 T. Berney, Beacon Hall. Ordsance and armous.

3473 T. Berney, Beacon Hall. Ordnance and armour Dated November 16, 1868.

This is partly based upon an invention, for which a patent was granted, dated January 25, 1867, No. 193, for improvements in constructing and applying defensive armour.—Patent abandoned.

3474 J. C. BOWLER, Hale. Castors. Dated November 16,

1868.

This relates, first, to that class of castors usually termed "ball castors," and the improvements consist in forming the interior portion of the cup or socket, against which the ball rests, of a swivel or movable curved plece, the remainder of the socket, containing the ball, being rather larger than the ball, which, when revolving, touches it on the side opposite to the direction of its motion, a little below the centre of the ball. The swivel or movable top bearing forms a resistance against the ball, in a direction hat adapts itself to the varying movements of the castors



Second, in adapting inclined movable surfaces as bearings coud, in adapting inclined movable surfaces as bearings, a first which the castors are secured; these inclined bear-gs are capable of being moved forward simultaneously, means of sciews.—Patent abandoned.

by means of sciews.—Patent abandoned.

3475 H. A. BONNEVILLE, Parls. Missiles. (A communication). Dated November 16, 1868.

The missile is of a conical-ogival conical truncated form, that is to say, it is composed of a point and body. The point is conical-ogival, and the body of the shape of a truncated cone, or of soveral parts of a truncated cone, or of soveral parts of a truncated cone joined together with the point. The missile is cast in a chill, and hardened outwardly, by plunging the gill into cold water, constantly renewed. If hollow, it has an inside chamber of iron or cast iron. The missile may be hardened inwardly, by causing a current of cold water to pass at high pressure through this chamber, thus rapidly cooling the yet liquid metal which has been poured into the chill.—Patent completed.

3476 J. SMITH, Chatham. Finishing fabrics. Dated No.

vember 16, 1863.

This consists in finishing woven fabrics, by passing them over and under a series of rollers, covered with card fillets or emery, or any other rough substance or perforated metallic rollers may be used. This coating or covering the rollers with card fillet or other rough surface is for the purpose of causing the fabric to adhere to the rollers, whilst an end to and fro motion is given to them by eccentrics on a side shaft or otherwise.—Patent abandoned.

3477 H. CARTER, Manchester. Gas burners. Dated No.

3477 H. CARTER, Manchester. Gas burners. Dated November 15, 1868.

The application of gas burners of the well-known "hydrocarbon" burner, and the improvements consist in supporting or attaching to one end of a balanced lever the "hydrocarbon" burner, which consists of a flattened piece of metal that is constructed to slide upon and fit the ordinary gas burner, so as to divide the flame opposite the end of the lever to which this piece of metal is attached. The latter is connected by a rod to an eccentric crank or other equivalent that is caused slowly to revolve through the medium of a coiled spring and wheels, similar to the works of a clock, the revolving of which transmit a rising and falling motion to the hydrocarbon burner, which, when in its lowest position, rests upon and divides the flame of the gas burner, and, when raised and free from the burner, leaves the flame of gas to burn in the ordinary manner.—Patent abandoned.

Patent abandoned.

3478 T. Martin, Dublin. Ammunition cases. Dated November 16, 1868.

These cars or trucks are constructed as follows:—They are formed with a watertight body provided with a lid or cover, also closing in a watertight manner, so that the car may be drawn through water without injury to its contents. The handle by which the car is drawn consists, by preference, of a pioneer's spade, of which the blade fits against the bottom of the car, while the handle is secured to the same by means of a clasp. At the back of the body as loop handle is provided, by which it can be lifted or pushed. A small watertight compartment is attached to the front of the body to hold gun, spikes, hammer, and mails, bandages, pins, lint, and other indispensable objects for succouring the wounded. One or more saws are fitted at the sides of the body, and pioneer's tools on the lid thereof, whereby the body will be rendered, to a certain extent, bullet proof. The car runs upon two wheels, which are, by preference, made of such a diameter as to be exactly 6ft. in circumference; and on the axle, which is fixed to and revolves with the wheels, is a worm, in gear with which is a worm wheel on the body of the car, imparting motion to any suitable known counting or registering mechanism.—Patent abandoned.

Imparting motion to any suitable known counting or registering mechanism.—Patent abandoned.

3479 J. J. RAVEL, Paris. Steam generator. Dated November 16, 1868.

This consists of a new arrangement of steam generator with rapid water circulation, heated by petroleum or mineral oil, by the aid of particular apparatus, and applicable to all industrial purposes, but more especially to steam locomotion on ordinary roads. The boiler is composed of a single serpentine coil (preferably of copper) communicating by its lower extremity with a double metallic envelope, and by its upper end with a steam reservoir, formed by an outer envelope of iron, steel, or copper. The water is fed in at the lower part of the double envelope by means of a feed pipe, and fills the same, and then enters the serpentine coil at its lower end, in which it rises and escapes from its upper end in the form of steam into the steam reservoir, which surrounds the whole apparatus. The furnace is placed below the serpentine, the coils of which are closed in such a manner as to form a wall all round. The gases of combustion are compelled to pass upwards through the cylindrical envelope thus formed, and then descend between the exterior of the spiral and the interior of the double envelope, and pass by a circular chamber, which surrounds the steam reservoir, to the chimney.—Patent completed.

3480 J. Matheson, jun., Glasgow. Dyeing and washing yarns. Dated November 16, 1868.

This consists in effecting these operations on the yarns by means of apparatus such as is at present used for dyeing and washing Turkey red cloth. The hanks of yarn are connected together to form chains by means of rings of brass, or other suitable material. The rings are made in any convenient way, so as to admit of easily connecting and disconnecting the hanks.—Patent abandoned.

3481 E. and A. Priest, Huddersfield. Carding engine.
Dated November 16, 1868.

The inventors apply a card roller mounted so as to rotate under and in contact with the first doffer cylinder at a slow speed, or such different surface speed to the doffer as will enable it to strip or take off the aforenamed bits of objectionable substances therefrom, and thereby prevent them passing forward through the machine along with the properly-carded fibre, an ordinary stripper being applied to work in connection with this roller, to knock off or remove the said bits therefrom.—Patent abandoned.

3482 E. Hogg, Gateshead. Straightening and planishing fron. Dated November 16, 1868.

This consists in the use of steel or chilled cast iron frictional rollers suited to the shape of iron required to be straightened and planished, such rollers being arranged so as to admit of the iron under operation being passed through them in a straight line. The pair of rollers in the centre of the machine are horizontal, and has a pair of vertical rollers placed one over the other at a suitable

distance on each side of the pair of central rollers. The horizontal central rollers are coupled by toothed wheels, one of which, on the vertical shaft of one of the said rollers, is driven by suitable gearing from the main shaft. The other roller is adjustable, as required, by means of a screw. The top vertical rollers are also adjustable.—Patent completed.

3483 J. HARE, Handsworth. Expanding tables. Dated

November 16, 1868.

This consists in making the screws used in table expanding apparatus or machines, by twisting or compressing the metal into the forms required to produce the threads, instead of cutting a portion away—Patent com-

threads, instead of cutting a portion away—Patent completed.

3484 A. M'NIEL and W. WHEATON, Exeter. Saits of ammonia. Dated November 16, 1868.

This relates to a process for obtaining sulphur saits of ammonia from ammoniacal liquor, more particularly that obtained in the manufacture of gas, the principal object being to obtain the ammonia in such a form and combination that it may be used as a manure. The inventors take the ammoniacal liquor as it comes from the gas works and add thereto a compound of earthy matters, of which gypsum or impure sulphate of lime (as obtained in the raw state) and chloride of sodium or common sait form principal ingredients; gypsum or sulphate of lime, when added to ammoniacal liquor, becomes decomposed, and the acid contained in the gypsum combines with a portion of the ammonia and forms sulphate of ammonia and hydro-sulphuret of ammonium, but it has been found that sulphate of lime alone will not be sufficient to take up or disengage all the ammonia contained in the liquor.—Patent completed.

3485 B. M. BONIWELL, Richmond, Surrey. Ricer boats.

forms sulphate of ammonia and hydro-sulphuret of lime alone will not be sufficient to take up or disengage all the ammonia contained in the liquor.—Patent completed.

3485 R. M. Boniwrli, Richmond, Surrey. River boats. This consists in two boats which are so nicely constructed in capacity and weight that their displacements are equal. These boats are held together by connecting braces. Nearly in the centre of these boats are constructed and fastened on to the deck of each, double bearings, through which revolves a crank shaft which has two cranks constructed thereon at 180deg. from each other. On each crank bearing there are two swivel links working on the crank at each end, and at the other end on the end of the treadles which work at the opposite end on two swivel links, which links swivel on the centre portion of the brace.—Patent completed.

3486 W. Low and G. Thomas, Cardiff. Suspension bridges. Dated November 16, 1868.

The inventors form the suspension chains for suspension bridges by combining together a number of oval link chains. These chains are placed side by side, and filling blocks or keys are driven in through the alternative corresponding links of the several chains, so as to bind them all together. They also combine several such compound chains by laying them one over the other, and driving filling blocks or keys through the several chains by the links which previously were left void.—Patent completed.

3487 S. W. CAMPAIN, Spalding. Steam tilling. Dated November 16, 1868.

The inventor provides the anchor carriage with a revolving anchor to restrain its forward motion. This anchor consists of an axis mounted on the carriage and having times or teeth projecting into the ground; on the axis there is a ratchet wheel, into the teeth of which a stop enters and holds the axis so long as it is not desired that the carriage should move forward, but when a forward movement is required, the stop is lifted by a hand lever, and then the anchor carriage are arranged so that they may be adjusted to project m

the strain which comes upon it.—Fatent completed.

3488 J. JONES and S. P. BIDDER, Mitcham. Breaking
doten coal. Dated November 17, 1868.

This consists in breaking down coal, slate, stone, and
other minerals, by means of apparatus wherein two or
more wedges are caused to be driven consecutively by
hydraulic or screw power between the surfaces of the substances to be broken down.—Patent completed.

stances to be broken down.—Patent completed.

3486 H. A. BONNEVILLE, Parlen tompleted.

3486 H. A. BONNEVILLE, Parlen Prognasticating the weather. (A communication). Dated November 17, 1868. The instrument is composed of the motor which imparts motion to the index needle. The motor is composed of two wooden strips or thin blades stuck one upon the other, the one operating the movement of attraction, which is called the positive, and the other operating the movement of repulsion, which is called the negative. These strips or thin blades of wood are curvilinear, and assume the form of an are of a circle. One of the extremities of this are is fixed to a square held by screws onto a brass disc; the other extremity is loose and movable; it is connected by a aliken thread passing round one of the two grooves of a pulley with an arbor forming the axis of the index needle. The attraction of the motor is counterbalanced by a spring fixed upon the brass disc and connected by another siken thread with the arbor, round the second groove of which it is wound.—Patent completed.

3490 R. Green, Rayswater. Covering telegraph wires.

completed.

3490 R. Green, Bayswater. Covering telegraph wires.
Dated November 17, 1868.

This consists in adapting and employing an exterior tubular covering or casing of suitable thickness and strength, which is proposed to be manufactured of lead or other soft or suitable metal, inside which covering or tube is enclosed or contained the telegraph wire or wires covered or surrounded with the ordinary insulating medium of india-rubber or other suitable insulating substance, the wires and insulating material fitting tightly inside the metallic covering or tube.—Patent abandoned.

3492 Gerard. Marquis de Montrichard, Paris. Trans-

density is used as counterweight to a column of quid of lighter density, sucked or supported in ultaneously, answering the purpose of a piston. completed.

completed.

3494 L. M. PREWETT. Stays. Dated November 17, 1868. This consists in the application to certain parts of stays or bodices of metal eyelets, formed with stamped heads, shells, or covers, and rings. or washers affixed thereto, which may be placed on the outside back and front, if required. The eyelets thus made are inserted through the material of the stays or bodice either at or through the ends of the ribs or bones of the same, which are usually formed of whalebone or steel, the shank or open end of the eyelet being secured in the ordinary manner.—Patent abandoned.

—Patent abandoned.

3495 W. R. Lake. Southampton-buildings. Bayonet. (A commulcation.) Dated November 17, 1868.

The handle of fire bayonet is made with provision for slipping it upon and locking it to the end of a musket or rifle barrel, and is united to the blade by a shank, the construction of the bandle and shank being the same, or substantially the same, as in the common bayonet. The blade is made trowel or spade-shaped, except that its body is preferably curved transversely the better to adapt it for use in retaining earth upon its surface, and it will be obvious that by bringing the front end to a point, the implement may be as readily used as an offensive as when made in the long slender form of the common bayonet.

—Patent completed.

—Patent completed.

3496 W. MANSFIELD, Birmingham. Brick sheds. Dated
November 17, 1868
This refers to such kilns as consist of a series of ovens
arranged in an annular form. The invention consists in
making the said annular space between the ovens and the
stack into a series of chambers, under which the flues of
the ovens pass, and heat the said chambers by the waste
heat from the ovens. The inventor employs these chambers
as drying sheds or drying chambers for drying the bricks
or other articles preparatory to burning. Entrance is
gained to said chambers or sheds either from the top
or by horizontal passages from the ovens.—Patent abandoned.

doned.

3497 A. CLARK, Chancery-lane. Making ginger snaps. (A communication). Dated November 17, 1868.

This consists in a box in which the dough is piaced, and which is securely attached to the frame of the machine. The dough has openings formed in its bottoms, through which the dough is pressed by the action of the follower, which fits into the dough box, and is securely attached to the lower ends of the bars, the upper ends of which are pivoted to the cross bar, so that the follower, when raised out of the box, may be conveniently swung to one side, to allow free access to the interior of the said box. In the ends of the cross bar are formed holes, having screw threads cut in them, through which pass the acrews, so that the follower may be raised and lowered, by turning the screws. The lower and upper ends of the acrews work in sockets or bearings attached to the frame.—Patent completed.

3498 H. A. Kehde, Kilburn. Working railway points.

S498 H. A. KEHDE, Kilburn. Working railway points. Dated November 17, 1869.

The inventor mounts a chain wheel or drum, so as to turn freely in bearings on a suitable framing or standards. A chain passes over this drum, one end being connected to the chain by rods, by which the signal, point, or switch, is operated, and to the other (which is pendent from the wheel) is attached a counter-balanced weight, for keeping the links or rods taut, and at the same time assist in maintaining the signal in position. On the axis of the chain wheel on either side he mounts an oscillating bell crank or other lever, the said levers being connected together at their extremities, and provided with pawls at one end, engaging with ratchet wheels formed on either side of the chain wheel, the said ratchets and pawls being arranged to act in contrary directions, so that on the bell crank lever being oscillated in either direction, the chain wheel will be partially rotated therewith, in order to raise or lower the signal as desired. The other extremities of these oscillating levers are connected to the ordinary hand lever, by which they are oscillated in either direction, for operating the signal or switch.—Patent abandoned.

3499 C. RICHARDSON, Gracechurch-steet, E.C. Looms.

3499 C. RICHARDSON, Gracechurch-steet, E.C. Looms.
Dated November 17, 1888.
This relates to improvements in looms for weaving, in which the shuttle is driven across the loom by a current of air acting directly upon each shuttle, and the invention mainly consists in certain improved arrangements and combinations of mechanism for effecting this object.—Patent completed. Patent completed.

3500 J. M. PRICHARD, Park-street, Hackney. Fountain Dated November 18, 1868

penholder. Dated November 18, 1868.

The barrel of this penholder, either in part or altogether serves as the ink reservoir, and all separate tubes or other apparatus inserted in or attached to the penholder, for holding the ink, are, therefore, dispensed with. The pen is attached to the penholder, in the method ordinarily employed when hollow penholders are used, by being inserted in a tube, whose opposite end is inserted into the barrel of the penholder, in such manner that it may be withdrawn at pleasure. This end of the tube is perforated with one or more holes to allow the ink to flow to the pen, or the end may be left entirely open for the purpose, the sides of tubes being made to it into the barrel in an airtight manner, by a coating of india-rubber or otherwise.—Patent abandoned.

2501 C. W. Sievens Great Georga streat. Finitesion.

Patent abandoned.

3501 C. W. Sirkens, Great George-street. Fusiening telegraph wires. Dated November 18, 1868.

The object of this invention is to provide a ready and simple means of attaching telegraphic line wires to insulators, whereby such wires may as readily be released again when required. For this purpose, the inventor constructs an eccentric or cam carried by a pin, upon which it can turn, and situated between two studs or grooves in such a manner that when the cam is turned into a certain position, the telegraphic line wire can pass freely between its edge and the studs or grooves, but when turned into another position, it is caused to press upon the portion of the wire between the two studs or grooves, and to bind it down, whereby the wire will be securely held. Instead of two studs or grooves, one only may be employed, and the wire be bent down on one side thereof by the eccentric or cam, or two such secentric or cams may be made to bend the wire down, one on each side of the stud or groove.—Patent sempleted.



3502 W. P. NASH, Great St. Helen-street. Postal boxes. (A communication). Dated November 18, 1868.

The inventor takes manilla hemp paper, or other strong or tough paper, and cuts the same into such a form or configuration that, when doubled up, a box can be formed of the same. Before forming the box, he so covers or partially covers the paper with tinfoil or lead, that the box when completed is lined with the tinfoil or lead.—Patent abandoned.

3503 C. E. BROOMAN, Fleet-street. Greasing wool. (A communication). Dated November 18, 1868.

This consists in an unctrous liquid product for oiling or greasing wool, silk, jute, and other textile materials. The base of this product is the common fucus (a kind of plant of the family of the ficoidal crytogames) collected in the form of grass on the sea coast, and from which the fatty part and the soda which it contains are extracted.—Patent abandoned.

3504 T. O. WARD, W. IBOTSON, and A. G. SOUTHBY few Inn, W.C. Manufacture of paper. Dated Novem-

abandoned.

3504 T. O. WARD, W. IBOTSON, and A. G. SOUTHBY, New Inn, W.C. Manufacture of paper. Dated November 18, 1868.

This consists, firstly, in evaporating alkaline liquor by means of the heat afforded by the regulated supply to and combustion in a suitable sole or fireplace, of the hydrocarbonaceous matter which such liquors hold in solution, the effect being to supersede, in a greater or less degree, partly or wholly, according to the less or greater dilution of the liquor, the necessity of coal, or other extraneous fuel for its desiccation. Secondly, in separating from the liquor under treatment to this end, either continuously or at intervals, as frequent as conveniently may be, its said self-contained fuel, so far as this solidifies to a crust or deposit coherent enough for removal. Thirdly, in applying this liquor-derived fuel in one or other of the following ways, viz, to feed a fire so disposed as to heat a series of three or more shallow liquor trays or receptacles, superposed in a chamber in such a manner that the heat may pass over and under them in succession, the first of such receptacles being fed by a regulated influx of the liquor for treatment, the second by a regulated supply from the first, and so on, each receiving a more concentrated supply till solidification commences, when the solid matter is removed from the liquid to a succeeding receptacle, where it undergoes further desiccation, and is finally advanced to the sole or fireplace in which it takes fire and is incinerated.—Patent completed.

advanced to the sole or fireplace in which it takes fire and is incinerated.—Patent completed.

3505 M. WILEIN and J. Chark, Paddington. Mining. Dated November 18, 1868.

The inventors propose to use lamps having gas, oil, or other illuminating materials, but instead of allowing these lamps to draw the air proper for their combustion from the surrounding air, they furnish them with air propelled from a pure source, such as the bottom or top of the shaft. They convey the air to supply the combustion in air-tight tubes to the interior of the lamps. They supply a greater quantity of air to the lamps than is necessary for the combustion of the gas or other illuminating material, and the overplus is caused to blow gently out of the escape valves or covers near the top of the lamps, thereby preventing the entrance of foul air, or air which has become mixed with inflammable gas in the mine known as firedamp.—Patent abandoned.

3506 A. M'DOUGALL, Manchester. Phosphatic manures. Dated November 18, 1868.

The inventor takes animal charcoal, or the substitute for animal charcoal, described below, and treats it with sulphuric acid, and then separates the sulphate of lime by filtration or other convenient means. He then agitates this sulphate of lime with ammoniacal liquor resulting from the destructive distillation of carbonaceous substances. By this means he obtains in solution sulphate of ammonia, which he separates from its solution by evaporation. The solution of acid phosphate of lime resulting from the destructive distillation of carbonaceous substances. By this means he obtains in solution sulphate of ammonia, which he separates from its solution by evaporation. The solution of acid phosphate of lime resulting from the destructive distillation of an evaluation of acid phosphate of immer as a substitute for animal charcoal in crystallizes as a substitute for animal charcoal in the above process by taking substances in a fine state of division containing phosphate of lime, and mixing with small coal or pitch, or other

vessels.—Patent completed.

3507 A. W. DRAYSON, Woolwich. Cooling wort. Dated November 18, 1868.

This relates to the cooling of liquids by employing the well-known principle of evaporation, which is induced or expedited by the aid of artificial currents of air to produce greater cold on the surface of the vessels containing the liquid to be cooled than the liquid indicates which is evaporated on those vessels. This result is obtained by alternately moistening and then drying the surface of the vessels containing the fluid to be cooled.—Patent completed.

pleted.

3508 B. Bell, Regent's Park. Iron ships. Dated November 18, 1868.

This consists, first, in increasing the depth of the hollows by the introduction of a strip of iron or other metal or material between each inside and outside plate, for the purpose of filling the enlarged hollows thus formed. Second, in filling these hollows with wood planking or other material, of such a thickness as to make the exterior of vessel a flush surface. The flush surface is then coated with sheets or plates of zinc or other metal sheathing, of such a breadth or size as to overlap and entirely cover the exterior iron plates, and the sheathing sheets or plates are fastened into the wood planking.

—Patent abandoned.

2509 W. L. GROUNDWATER. Plumstead. Cars and cart-

2510 W. T. Brown of the same.—Patent abandoned.

2501 W. T. Brown of the same.—Patent abandoned.

for recapping the same.—Patent abandoned.

3510 W. T. BASSET, Sydney, N.S.W. Dressing sheep.
Dated November 18, 1868.

The apparatus the inventor employs in carrying out this invention may be of a stationary character, or it may be so constructed and arranged as to be capable of being moved from place to place on land, in trucks or otherwise, as required, or it may be mounted on pontoons or otherwise arranged so as to be capable of being floated from place to place, and worked either on land or water. The

animal to be washed is taken, when either on land or in water, and secured, by preference when in the water to travelling bearers and yokes, and carried through the apparatus, and it is preferred to secure the animal to such travelling yokes when laid upon its back. Adjustable collers, clips, or other suitable contrivances are provided, attached to the travelling bearers, by means of which the neck or other part of the animal is held in the desired position, whilst being carried through the apparatus, and it is preferred to mount the travelling bearers and yokes upon an endless chains or ropes, though they may be otherwise mounted and actuated, according to this invention, such chains or ropes passing around chain or other wheels, to which movement is imparted by means of suitable driving wheels or pulleys, so as to cause the chains and bearers being under the control of an attendant, who either gives motion to such travelling chains, or has the mechanism by which they are actuated under entire command.—Patent completed.

chanism by which they are actuated under entire command.—Patent completed.

"8611 H. D. Hossold and G. P. Wheeler, Cinderford Gloucester. Artificial fuel. Dated November 19, 1868..

The inventors take small coal, coal dust, lime, coal slack, culm, or other bituminous substance, which they grind fine, and to this they add during the process of grinding "coal shale clay," and, by preference, make choice of that particular shale which is always found associated with coal of every kind under ground. This they intimately mix with the coal dust, slack, or culm, and pass the same into a mixing pan, when to the substance mixed they add pulverized resin, a proportion of asphalte or compact natural bitumen, to which a vegetable glue is added, made in the following manner:—To fifty gallons of water, the inventors add five pounds avoirdupois of rice, and five pounds avoirdupois of the glue or gluten extracted from Indian corn, meal, or miaze, which, when in solution boiled for half an hour, is fit for use. The above quantity is used with the above ingredients, and when thoroughly mixed together in the mixing pan, the whole is caused to adhere and form a compact paste, and can then be moulded into blocks, which is done by pressing machinery, and under such a pressure that the block will become solid. The paste thus moulded into blocks is placed in a drying chamber or vessel, in order to be desiccated, when it becomes, in a short time, so hard as to bear carriage to a considerable distance.—Patent completed.

3612 G. V. FOSBERRY and V. C. COWLEY. Breech-loaders.

3512 G. V. FOSBERRY and V. C. COWLEY. Breech

3612 G. V. Fosberry and V. C. Cowley. Breech-loaders.
Dated November 19, 1868
The block slides in vertical grooves in the breech chamber, and is raised or depressed therein by a lever pivoted at the rear of the chamber. The firing pin extends through the block and lever. The block and lever are depressed to open the breech, and the empty cartridge shell is ejected, and the plees cooked by one movement of a sliding extractor bar, which is arranged at the side of the breech chamber. A stud on this sliding bar works in an inclined slot or passage in the lever, and acts as a cam to raise or depress the same. The main spring is attached to the under side of the block lever, or when the lever itself forms the breech block of stopper, the spring may be fixed directly on the block. The lock is provided with a hammer, which, by means of an ordinary trigger, is caused to drive forward the firing pin. The block lever is sometimes provided with a plate, which is caused by the extractor bar to start the pin from the base of the shell.—Patent abandoned.

3513 S. CRIGHTON and J. TATT, Manchester. Grinding

extractor bar to start the pin from the base of the shell.—Patent abandoned.

3513 S. Crighton and J. Taft, Manchester. Grinding cards. Dated November 19, 1868.

The inventors arrange the grinding roller with its axis at right angles, with the line of direction of the traverse or at an angle therewith, other than a right angle in contration to the parallel or nearly parallel arrangement. The roller is caused to revolve on its axis, and at the same time, has a to and fro motion, in the direction, or nearly in the direction, or learly in the direction of its axis, and is also traversed from end to end of the flat or flats, or of the card rollers, liekers, or other roller or rollers, or cylinder or cylinders, being at the same time operated upon as will be well understood; or, if preferred, the roller flat or cylinder being operated upon may be traversed in the direction of its axis or of its length. The traverse is effected by means of a revolving scrow, fitted with an arrangement for reversing the direction of motion of the screw, when the grinding roller reaches each end or side of the surface being operated upon, one may be effected by other suitable or well known means, and the motion of the said grinding roller endwise is effected by means of eccentric or cam, sliding on a revolving shaft, or by other suitable means, the revolving motion being imparted to the said grinding roller by means of bevel gearing, or by means of a "flying band" or otherwise, as found most suitable.—Patent completed.

3514 W. THOMPSON, Dublin. Packing cases. Dated November 19, 1868.

This consists in so constructing cases or boxes for packing bottles or jars, that these are held securely in their places by means of springs of metal, india-rubber, or other material made to press against one or both ends thereof.—Patent completed.

Patent completed.

3515 C. D. ABEL, Chancery-lane. Phosphorus. (A communication). Dated November 19, 1868..

This consists, mainly, in the treatment of materials intended to produce phosphorus, directly in the presence of the fuel inside a blast furnace, in which the combustion is accelerated by the application of an air blast. This new application of blast furnaces in combination with blowing machinery, to the manufacture of phosphorus, constitutes the essential feature of this invention, the principal advantage of which consists in substituting for the laboratory apparatus employed heretofore for this purpose, an industrial apparatus, namely, the blast furnace, of simple construction and operation, thus really rendering the manufacture of phosphorus an industrial operations capable of boling carried on on a large scale. This apparatus may be employed with equal advantage for producing both varieties of phosphorus, namely, the ordinary phosphorus and the amorphous phosphorus.—Patent completed.

3516 H. Carrieg, Manchester. Tribasic phosphate of

amorphous paosphorus.—Patent completed.

3516 H. Carrigo, Manchester. Tribasic phosphate of lime. Dated November 19, 1868.

This consists in the manufacture or production of tribasic phosphate of lime from horn piths or solid bone or other osseous substances, by decomposing them in diluted hydrochloric acid, and afterwards precipitating the phosphate with slacked lime. The phosphate thus produced is used with great advantage for cupelling flint glass, making polishing plate and similar materials, and

also for phophatizing flour sweetmeats and similar articles. —Patent, abandoned.

—Patent abandoned.

3517 W. Avery and A. Fenton, Redditch. Needle cases.
Dated November 19, 1868.

The inventors form a quiver or flat case to receive a packet of needles, one end of the case being open for such purpose. At or near the bottom end of the case in one side they cut a slot in which works a thumb bit or small stud, attached to a clip or holder. Into this clip or holder the end of the needle packet is insorted, so that to expose or extract the needles, the thumb bit or stud is pressed and slides upward in the slot, taking up and partly out of the case the needle pakeet, which is pressed down into its place when required.—Patent completed.

3519 D. JONES and J. JACKSON. South Hackney. Heat-

the case the needle pakeet, which is pressed down into its place when required.—Patent completed.

3519 D. JONES and J. JACKSON, South Hackney. Heating the body. Dated November 19, 1869.

This consists in a box or chamber, which may be constructed either of any suitable form, so as to be portable or movable or a fixture, and formed of metal, wood, wickerwork, papier mache, or other suitable material, alone or combined with other materials. The sides or bottom, or both the sides and bottom, of the box or chamber are perforated or provided with apertures, which may be protected by wire gauze, or finely perforated metal, so as effectually to confine the flame of the lamp within the box or chamber, these perforations or spertures being for the admission of air to the interior of the box or chamber for the support of combustion, and the inventors prefer to provide the box or chamber with feet or supports to raise the bottom of the box or chamber a short distance above the floor or place upon which it may stand. Within the box or chamber they arrange a vessel containing oil or spirit, which it is preferred to be so arranged as to be readily removable, and they provide this vessel with one or more wicks, burners, or other contrivances for burning the fluid contained in the lamp or vessel. Ordinary burning oils or spirits may be employed for combustion in the lamp, but according to their improvements the inventors prefer to employ spirits of wine or methylated spirits, owing to the absence of smoke and unpleasant smell during the combustion of these liquids—Patent completed.

S520 J. M'Graatz, Belfast. Shirts. Dated November 19,

3520 J. M'GRATH, Belfast. Shirts. Dated November 19,

1868. This consists in applying to shirts of the ordinary shape and construction a breast or front, having a band or plate of the same or some different material or pattern, so arranged as to imitate the appearance and dispense with the use of a neck scarf. The outer ply of the band or plate extends or rises in a loose flap or tongue over and to the higher edge of the neck band, and is fastened up in that position by means of a stud or pin, or some imitation thereof, passing through it from the neck band. The under ply of the band or plate it is attached to the neck band, which may, if desired, be fastened round the neck by a button in the ordinary way.—Patent abandoned.

band, which may, if desired, be lastened round the need by a button in the ordinary way.—Patent abandoned.

3521 J. Green, Lisburne, Ireland. Manufacture of rope. This consists in treating the materials after they have been manufactured in the ordinary way, and after having been passed through a trough of water or size, as is commonly practised, by drawing the same by means of the revolving reel or reels, by which the material when finished is taken up, under and over a series of revolving cylindrical bars or free pulleys placed at intervals outside the periphery of a large drum or cylinder. These bars or pulleys are grooved so as to admit and guide the material under process, and they are borne by adjustable sugs or brackets, attached to bolts, each having a screw threaded end, and working into a socket in or upon a fixed framework at the end of the drum or cylinder, or by adjustable slot pieces in or upon said fixed framework, or by other similar adjustable bearings, by which the material under process may be subjected to a greater or less extent of contact with the drum or cylinder.—Patent completed.

3522 E. H. BAXLEY, Newington Causewsy. Carts.

contact with the drum or cylinder.—Patent completed.

3522 E. H. BAYLEY, Newington Causewsy. Carts.
Dated November 20, 1868.

This consists of the combination of a furnace and anow
melting apparatus with a cart or other vehicle, which
may or may not be used as an ordinary water cart. A
wrought-iron tank is raised on wheels, say, four in number, and has shafts or a pole fitted thereto, together with
a seat for the driver, as in ordinary water carts. At the
top of the cart, and constituting the whole of its upper
surface, except the seat for the driver, is a hopper, or
other suitable receptacle, for the snow as it is delivered
from the shovels or hods of the scavengers. The hopper
is divided into two parts, an upper and a lower chamber,
by means of a sleve or perforated plats, which prevents
the entrance of stones and other foreign bodies into the
lower chamber.—Patent abandoned.

3523 J. McGLASHAN, Dundee. Universiting ropes.

Dated

3523 J. McGlashan, Dundee. Univisiing ropes. Dated

lower chamber.—Fatent abandoned.
3523 J. McGLASHAN, Dundee. Univisiting rops. Dated
November 20, 1868.
These improvements comprise a tube or hollow spindle,
in to one end of which the rope to be untwisted is introduced. This hollow spindle, being mounted in bearings in
the framing, is made to rotate therein by means of a
toothed driving wheel, gearing with a toothed wheel fixed
on the said hollow spindle. In gear with the same
driving wheel, or with a second driving wheel of a slightly
different size, there is a toothed ring loose on the hollow
spindle, which ring revolves at a rate slightly different to
that of the hollow spindle, and which, by means of skew
bevel teeth drives a bevel wheel on the axis of a pair of
small rollers, carried by the hollew spindle. The two
rollers are placed in a plane, at right angles to the axis of
the hollow spindle, and the rope passes between and is
nipped by them. The slight differential motion of the
loose ring, which is imparted to one of the rollers, as
described, causes the rollers to feed the rope gradually
through, whilst, as they are carried round by the rotation
of the hollow spindle, they untwist it as it passes. The
rollers may be plain or fluted, or otherwise roughened,
and may be pressed together by springs or screws in order
to nip the rope.—Patent completed.

2524 J. D. Horkins, Bedford-square. Window sasker.

to nip the rope.—Patent completed.

3524 J. D. HOPKINS, Bedford-square. Window sashes.
Dated November 20, 1868.
This consists in winding the suspending cords of window sashes around drum wheels or cylinders, placed beneath the sills of the frames, or in any other convenient situation, the drum wheels or cylinders being operated upon by gearing, worked by a cranked handle, or otherwise.—Patent completed.

3526 A. GUTHRIE, Craigs, N.B. *Ploughs*. Dated November 20, 1868.

This relates to improvements in that class of ploughs in



which two or more furrows are turned simultaneously, and the whole weight of the implement is supported on wheels. The body of the plough consists of a rectangular frame, to which the coulters and mould boards are fastened in such a manner that they can be readily shifted in position, to form any required depth of furrow. The guiding and land side wheels are attached to this frame by means of adjustable levers, which will admit of the coulters and mould boards being raised or lowered, and guided so as to form two or more furrows simultaneously, of uniform breadth and depth. These levers are under the control of the attendant, and can be instantly shifted to sait the varying nature of the soil, without the necessity of stopping the horses. The axle of the hind or trailing wheel is attached by a movable bracket to the frame. This bracket is so formed that the trailing wheel can readily be shifted to a greater or less angle, so as to have more power over the mould boards.—Patent completed.

3527 A LEYKAUF. Nuremburg, Bayaria. New colouring

more power over the mould boards.—Patent completed.

3527 A. LEYKAUF, Nuremburg, Bavaria. New colouring matter. Dated November 20, 1868.

The process is best practically performed as follows:—The inventor takes pure manganese, or the cheat of chlorine, and mixes it with phosphoric acid. He heats it till fluessed. After cooling, the manganese is precipitated by ammonia, or carbonate of ammonia, and is poured, with the liquid flowing from the coarser undecomposed manganese ore, into another vessel, in which the mixture is evaporated. Iron, or an oxide or other compound, may be added for certain shades.—Patent completed.

3528 B. BRITTEN, Red Hill. Fishing rods. Dated November 20, 1868.

S528 B. BRITTEN, Red Hill. Fishing rods. Dated November 20, 1868.

Instead of wood for those parts which are required to be pliant and elastic, the inventor makes use of steel, iron or other suitable metal, of such form in transverse section as will secure the requisite longitudinal strength combined with lightness and elasticity. He makes the rods of different lengths, sizes, and proportions, and with such fittings of the ordinary kind as are required. He constructs them generally of steel or iron, in the form of tubes of very thin substance, the thickness of metal varying from about No. 25 to about No. 33 of the wire gauze. The tubes are either welded or soldered and drawn into shape in the ordinary way, and they may be either taper in length or parallel. They are hardened and tempered in the usual way, or a sufficient degree of elasticity may be obtained by slightly casebardening them by the common process, or by coating their surfaces with tallow, or other fatty matter, and heating them to a sufficient temperature to burn or carbonize the tallow, and then cooling them in the air.—Patent completed.

3529 F. D. SUTHERLAND, King William-street. Cravat

air.—Patent completed.

3529 F. D. SUTHERLAND, King William-street. Crarat holder. Dated November 28, 1868.

This consists, first, in the use of a double hook-shaped piece of metal or other material, the hooks of which are bent in opposite directions into something like the shape of the letter S flattened. Second, in making the double hook piece in two parts capable of sliding upwards, one within the other, so as to enable the compound hook-shaped piece to be adjusted to suit cravats of different widths, or the inventor employs a piece of metal formed with a hook at one end only, and a hole near the other end with a slit below.—Patent abandoned.

asso W. Brookes, Chancery-lane, W.C. Lace machinery. (A communication). Dated November 20, 1868.

This consists in doubling the size of the hole or mesh by uniting two by two the bobbin threads, which, while making the ground or not only form a single thread, but, on the contrary, are separated while making the muslin or fining. For this purpose there is employed with each set of two bobbin threads two warp threads, one of which is conducted by the stump bar and the other by one of the independent bars generally employed for gymping and embroidering.—Patent abandoned.

embroidering.—Patent abandoned.

3531 H. B. Cowrll, Islington. Distributing water.
Dated November 20, 1868.

The matter to be distributed is placed in a trough in which is supported the axis of a rotary brush, or a series of brushes, by the rotation of which, by a handle or otherwise, the matter in the trough is taken up, and then, by the edge of a plate, which may be capable of adjustment in bearing upon the surface of such brush as it revolves, the matter so taken up from the trough is spirted or thrown forwards in quantities dependent on the position of the edge of the plate in bearing upon the brush.—Patent abandoned.

Patent abandoned.

3532 W.R. Lake, Southampton-buildings. Reciprocating gauss. (A communication). Dated November 20, 1868.

This consists in imparting reciprocating motion to a scroll saw from a revolving shaft by means of flexible bands attached to the upper and lower ends of the saw, the said bands passing over suitable pulleys and being connected to pins disposed eccentrically upon driving wheels secured on the said shaft, or to bands encircling wheels secured eccentrically thereon. Rods, links, or other rigid connections between the saw and its motive power are thus dispensed with.—Patent completed.

2533 G. EGUILLON, Paris. Suspending bells. Dated

3533 G. EGUILLON, Paris. Suspending bells. Dated November 20, 1868.

This consists in suspending bells by means of three oscillating levers.—Patent completed.

8534 C. DESCAT and H. GUILLAUM, Paris. Fixing Nours. Dated November 20, 1868.

colours. Dated November 20, 1868.

This consists in the employment of metallic solutions of iron, copper, manganese, or chronium, either singly, mixed together, or in conjunction with colouring matters, for printing on textile fabrics, consisting of wool and cotton, wool and thread, goat's hair and cotton, goat's hair and thread, alpaca and cotton, alpaca and thread, and all other tissues composed of a mixture of textile, vegetable, and animal matters, either by means of the cylinder printing machine, or otherwise, the process being the same as that for printing thread tissues, thread and cotton, or cotton; the fabrics are allowed to oxydize after the application of the solutions and colouring matters, the oxydion being completed by subjecting them to an alkaline or tion being completed by subjecting them to an alkaline or bichromate bath—Patent completed.

3535 A. V. NEWTON, Chancery-lane. Secting needles. (A communication). Dated November 20, 1868.
This consists in constructing the eye with a lateral opening and an elastic hook, and an inelastic head at the root of such hook, or with the same and an inelastic abutment.—Patent completed.

and baling straw. (A communication). Dated November 20, 1868.

and baling straw. (A communication). Description 20, 1868.

The inventor first cuts the hay or straw quite short, say from one-fourth to one and one-half an inch in length, with any suitable hay cutting machine. A crushing machine is placed in close proximity, and in such relation to the cutting machine that the cut hay or straw will pass directly from the cutting machine to the crushing machine and be crushed or flattened in its passage through the machine, and thus made soft and edible. The cut or crushed hay is winnowed, or subjected to a current of air, for the purpose of removing therefrom such dust, dirt, grit, and foreign matter as may be collected therein.—Patent completed.

3537 J. G. TONGUS, Southampton-buildings. Yarns or

3537 J. G. TONGUE, Southampton-buildings. Yarns of greads. (A communication). Dated November 21, 1868. 353 J. G. TONGUE, Southampton-nullaings. Tarms or threads. (A communication). Dated November 21, 1868.; A rubbing of the thread against itself is produced by any suitable mechanism, or by causing it to interlace among or around bars having a to and fro or reciprocating movement.—Patent abandoned.

3538 J. Scholes and J. Leach, Huddersfield. Preparing

3538 J. SCHOLES and J. LEACH, Hundersheld. Preparing vool. Dated November 21, 1883.

This relates to means and apparatus for treating wool or other fibre, after being partly carded by the machine known as the "scribbler," to prepare it to be fed to either the second carding engine or the condenser carding engine. The inventors employ any ordinary means for forming the fibre into roping as it is stripped from the doffer eyinder of the scribbler. The roping is then passed between two pairs of rollers, supported on suitable framing, which deliver it upon an endless travelling belt. This belt conducts the roping from the rollers to a certain distance, where the first pair of rollers remain stationary, while the other pair continues to rotate, whereby the roping is broken or a length is separated from the remainder.—Patent abandoned.

3539 C. D. ABEL, Southampton-buildings. Tobacco pouch and cigarette former. (A communication). Dated November 21, 1868.

ber 21, 1868.

The framing of the pouch is formed of such a depth at The framing of the pouch is formed of such a depth at the top as to contain the cigarette former, the frame of which is formed by the part of the pouch frame to which is formed by the part of the pouch frame to which is hinged another part. This frame carries the three rollers, two of which are of equal diameter, while the other is ratier larger. An endless ribbon, of a width corresponding to the length of the cigarettes to be made, passes over the three said rollers, openting in similar manner to the cigarette formers now in use; a small ribbon is attached to the ribbon at the point, and serves to make the same travel in one direction or the other over the rollers, by drawing either at one end or the other. Spring catches hold part of the pouch when closed up. Two studs, by being pressed inwards, release the catches.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT.

#### Dated May 24, 1869.

Dated May 24, 1869.

1596 M. H. de Goesbriand, Boulevard Bonne Nouvelle, Paris. Improvements in steam motors.

1597 E. T. Hughes, Chancery-lane, Improvements in machinery or apparatus for the manufacture of brushes.

1598 G. Salt, Saltaire, Yorksbire, and W. Inglis, Bolton, Lancashire. Improvements relating to steam engine governors and admission or throttle valves.

1599 A. Barclay, Kilmarnock, Ayrshire. Improvements in apparatus for injecting and ejecting liquids or fluids, ejector condensers, blow-through condensers, and in mechanism connected therewith.

1600 J. Brittain, Bowling Green-lane, Clerkenwell, Middlesex. Improvements in the construction of telegraphic instruments.

Dated May 25, 1869.

1601 B. Richardson, Great George-street, Westminster. Improvements in velocipedes.
1602 J. Dick, Coatbridge, Lanarkshirs. Improvements in the rolls for rolling mills.
1603 J. H. Johnson, Lincoln's Inn-fields. Producing imitations of, and substitutes for, wood, ivory, stone, and other hard substances, applicable to the manufacture of billiard balls and other articles.

1604 J. Trotman, Gloucestershire. Improvements in fastenings for uniting the ends of machine driving bands or straps.

fastenings for uniting the ends of machine driving bands or straps.

1605 W. Jones and T. Sheffield, Manchester. Certain improvements in mathematical instruments to be employed for scribing or drawing geometrical lines.

1606 F. T. Blake, Boulogne, France. Improvements in obtaining motive power.

1607 G. H. Hoare, Southampton-row, Middlesex. Improvements in velocipedes.

1608 A. M'Nelle and J. Slater, John-street, Pentonville, Middlesex, Improvements in carriers wheels.

Middlesex. . Improvements in carriage wheels Roman, Paris. Improvements in a

1609 L. Roman, Paris. Improvements in apparatus or mechanism for obtaining and applying hydraulic motive

ower.
1610 R. Wheble, Cockspur-street, Middlesex. Improve

1610 K. Wheble, Cockspur-street, Middlesex. Improvements in hats or coverings for the head.

1611 B. Schomburg, Fleet-street, City. A new apparatus for receiving and discharging cigar and tobacco ashes in railway and other carriages, which invention is also applicable for advertising purposes.

also applicable for advertising purposes.

Dated May 26, 1869.

1612 M. Benson, Southampton-buildings, Chancery-lane. Improvements in tools for cutting glass and other vitreous substances.

1613 W. Palliser, Army and Navy Club, Pall Mall. Improvements in vents and screw nuts or collars for ordnance, which latter improvements are also applicable to screw bolts and nuts generally.

1614 H. D. M'Master and A. Dale, Gilford, Downshire, Ireland. An improved governor or regulator for steam engines.

A. V. Newton, Chancery-lane. Sening needles. (A mication). Dated November 20, 1868. consists in constructing the eye with a lateral openia an elastic book, and an inelastic head at the root hook, or with the same and an inelastic abutment at completed.

W. B. Lake, Southampton-buildings. Preparing

carding engines, when the fleece is broken, or par-

tially so.
1617 C. E. Brooman, Fleet-street, City, patent agent.
Improvements in bleaching vegetable fibres, threads, and

Improvements in bleaching vegetation acres, fabrics.

1618 J. D. Brunton, Leighton-crescent, Kentish Town, Middlesex. Improvements in machinery for tunnelling, shaft sinking, and stone dressing.

1619 C. F. Chew, George-street, Chalk Farm-road, Middlesex. Improvements in pianofortes.

1620 J. J. Field, Highgate, Middlesex. Improvements

applying polarized light in connection with the microope. 1621 C. Hanson, Chapel Hill, Huddersfield, and J. Bot-

1621 C. Hanson, Chapel Hill, Hudderstield, and J. Bot-tomley, Kirkgate, Hudderstield. Improvements in means or apparatus for obtaining motive power. 1622 J. Cranton, Birmingham. Improvements in the construction of glass houses for horticultural purposes. 1623 J. Bridges, Ludgate Hill, City. An improved lever lock or fastening, suitable for various useful pur-

poses.

1624 G. H. Ellis, Gracechurch-street, City. An improved apparatus for cleaning boots and shoes.

1625 R. P. Williams, Great George-street, Westminster. Improvements in fishes for fishing railway rails.

1626 F. H. Lloyd, Wednesbury, Staffordshire. Improvements in the manufacture of steel and iron tubes and gun barrols.

barrels.

1627 E. G. Bartholomew, Chepstow Villas, York-road, Upper Holloway, Middlesex. Improvements in the construction and arrangements of electrical apparatus.

Dated May 27, 1869.

1628 L., W., and J. Beesley, Datton in-Furness, Lancashire. Improvement in boilers.

1629 J. Snape, Mountain Ash, near Aberdare, South Walos. Improvements in pumps.

1630 A. Edimann, Palmerston-buildings, Bishopsgatestreet, City. Improvements in machinery and apparatus for the manufacture of peat for charcoal, peat, fuel, and firelights, and for other purposes.

1631 F. S. Angel, Hatton-garden, Middlesex. Improvements in the manufacture of tablets for advertising and other purposes.

other purposes.

1632 F. A. Barrow, Glasgow. Improvements in parify-

1632 F. A. Barrow, Glasgow. Improvements in parifying or bleaching mineral oils.
1633 D. Foster, Sheffield. Improvements in the manufacture of hollow shot or shell.
1634 P. Whiteside, Fox-street, Liverpool. Improvements in mowing and resping machines.
1635 H. M.E. Ward, Loop Bridge Mills, Ballymaconaghy, Rnockbreds, County Down, Ireland. Improvements in machinery for spinning or twisting flax or other fibrous substances.

Dated May 28, 1869.

Dated May 28, 1869.
1636 T. Bradford, Fleet-street, City. Improvements in the construction of drying-closets and drying-horses.
1637 C. Plumb, Commercial-road, Lambeth, Surrey. An improved ratchet brace, combining boring, tapping, screwing, and cutting-off apparatus.
1638 H. A. Bonneville, Sackville-street, Piccadilly. An improved box for enclosing portraits and photographic cartes.

1639 B. T. Newnham, Bath. Improvements in car-

1649 J. Wilson, Royal Exchange-buildings, E.C. Improvements in wooden railways.

1641 J. Wilson, Royal Exchange-buildings, E.C. Improvements in the manufacture of wrought iron.

1642 J. Bronner and H. Gutzkow, Frankfort-on-the Maine, Prussia. An improved method of obtaining anthracen out of asphaltos, that is to say, pitch produced from coal tar, and of preparing two colouring matters from the anthracen.

1643 S. and J. Prestwich, Farnworth, Lancashire. Improvements in velocipedes.

1644 J. Ingham, Valley Dye Works, Bradford, and L. Butterfield, Bradford. Improvements in machinery or apparatus for dressing warps.

1644 J. Ingham, Value Jye works, Fractord, and Fatterfield, Bradford. Improvements in machinery or apparatus for dressing warps.

1645 G. J. Pedley, Harborne, Staffordshire, and H. Grabowski, Willenhall, Staffordshire. An improved motive power for driving velocipedes, sewing machines, and for other similar purposes.

1646 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in brushes for cleaning the tubes of steam boilers.

1647 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in machinery employed in the manufacture of bolts and nuts.

1648 G. F. Guy, Bury St. Edmunds, Suffolk. Improvements in sheathing for ships and vessels.

1649 T. Clarke, Ladyfield, Wilmslow, Chester. Improvements in the construction and working of velocipedes for use on land or water, parts of which improvements are also applicable to wheeled vehicles of every description. escription. 1650 B. C

ments are also applicable to whose twelves of every description.

1650 B. Garner, Oldbury, Worcestershire. Improvements in the bearings of axles for railway carriages and trucks, and in lubricating the said axles.

1651 F. Brown, Luton, Bedfordshire. Improvements in velocipedes called bicycles.

1652 A. T. Fairgrieve, West-street, Sunderland. An improved paste or composition adapted for coating the bottoms of wood and Iron ships.

1653 J. Fraser, Arthur-street, Park Hill-road. Liverpool, and L. and R. Simon, Hutchinson-street, Wilford-road, Nottingham. An improved machine for cutting and scoring pasteboard and similar materials one or several times at one operation.

Dated May 29, 1869.

1654 J. L. Hancock, Ley Hill, Sutton Coldfield, Warwickshire. Improvements in apparatus for making hay and harvesting corn and seeds.

1655 J. L. Hancock, Ley Hill, Sutton Coldfield, Warwickshire. Improvements in apparatus for clipping and trimming horses and other animals and for shearing sheep.

sheep.
1656 A. Hemingway, Manchester. Improvements in

1656 A. Hemingway, Manchester. Improvements in slide valves.
1657 E. J. Hughes, Manchester. Improvements in the preparation of cloth and yarn for printing and dyeing.
1658 W. H. Turner. Blackburn. Improvements in means for lessening the discharge of smoke from furnaces.
1659 J. Humphrey, Inches, Aberdeen. Improvements in the construction of iron keelson, and in the application thereof to wooden ships and vessels.
1660 J. Sturgeon, Bolton-le-Moors, Lancashire. Improvements in machinery and apparatus employed in

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WILLIAM RYDER

connected with, the getting of coal and other

minerals.

1661 J. M. Muterse and H. G. de Valory, Guerande, Department de la Loire Inferieure, France. A novel lique-fiable compound substance to be used for extinguishing fires, termed anti-flame powder.

1662 A. A. Sax, Paris. An improved system of railway with helicoidal propulsion.

1663 E. Davis, Great Mitchell-street, Middlesex. Improvements in valued pades.

1663 E. Davis, Great Mitchell-street, Middlesex. Improvements in velocipedes.
1664 J. Smith, Loth, Belgium. Improvements in apparatus for holding the bobbins on the tubes or spindles of spinning and cap frames, also for regulating the drag of the thread passing on to the bobbins of common spinning

frames.

1665 J. F. Nicholls, Bristol. Converting any dining table into a billiard table in a few minutes, without injuring it or interfering with the purpose for which it was originally designed.

1666 J. J. R. Humes, Adolphus-street, Deptford, Kent. Improvements in brick moulds as applicable to brick machinery.

machinery.

Dated May 31, 1869.

1667 J. Cockshoot, jun, and H. Weatherill, Manchester.
Certain improvements in the construction of carriage axies and axie boxes.

1668 P. Kirk, Workington, Cumberland. Improvements in puddling furnaces, and in other furnaces employed in the manufacture of iron and steel.

1669 H. T. Braithwaite, Cardington-street, London. Improving two-wheeled velocipedes, commonly known as bicycles.

1670 J. Hanworth and H. Horsfall, Lancashire. Certain improvements in furnaces for steam boilers and other

purposes.

1671 R. S. Bartleet, Redditch, Worcestershire. Improvements in needle cases or needle holders.

1672 R. Littler, Cannock, Staffordshire. A new or improved guard for circular saws.

1673 J. Bullough, Accrington, Lancashire, and C. Catlow, Burnley, Lancashire. Improvements in looms for weaving.

weaving.

1674 C. E. Brooman, Fleet-street, City, patent agent.

Improvements in the construction of boilers and furnaces
for generating steam and for economizing fuel. (A com-

for generating steam and for economizing rues. (A communication),
1675 G. Preston and J. Prestige, Deptford, Kent. Improvements in lamps.
1676 R. Mathers, Leeds. Improvements in supports and mattresses for beds, couches, ottomans, sofas, and similar articles of furniture.
1677 J. Dockray, Quebec Foundry, Leeds. Improvements in carding engines.
1678 W. E. Newton, Chancery-lane. A novel device for locking corks or stoppers in bottles and other necked vessels.

vessels.

1679 D. Evans, Charles-terrace, Casland-road, South
Hackney, Middlesex. Improvements in the construction
of ships, boilers, buoys, casks, and other articles, by welding together the plates or parts of which they are formed.
1680 J. King, Walk, Norwich. An improved cinder

1680 J. King, Walk, Norwich. An improved cinder sifter.

1681 S. Birch, Belfast. Improvements applicable to handkerchief, glove, and other fancy boxes.

1682 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in mechanism for propelling and guiding vehicles, and for driving machinery by muscular

power.

1683 H. Holdrege, New York, U.S.A. Improvements in the process of making gas for illuminating, heating, and other purposes, and in apparatus for the manufacture thereof.

thereor.

1684 J. H. Johnson, Lincoln's Inn-fields. Improvements in stoves for culinary purposes.

### NOTICES OF INTENTION TO PROCEED WITH

PATE	
From the "London G	
167 S. G. Archibald	259 J. Silman
172 J. Armstrong	270 R. Blackbee
174 N. D. Spartali	283 G. Price
182 E. Burton	287 F. Jay
184 P. C. Evans and	300 G. H. Adam
H. J. H. King	320 J. Bird
186 H. A. Bonneville	330 C. D. Abel
191 J. W. Wilson	336 J. R. Johnson
206 A. Maw	366 C. G. Hill
212 W. Burgess	399 L. A.C.St.P.de Lingay
213 J. Beattie	462 C. W. Lancaster
215 J. Ortton	472 B. J. B. Mills
217 W. Huggins and H.	479 J. W. Yates
Horsnaill	517 A. M. Clark
219 H. H. Murdoch	570 W. A. Ives
220 B. Mountain, T. Rich-	575 R. Morton
mond, and G. Duf-	589 F. Brady
field	773 H. C. Bartlett and
223 W. M. Welling	A. G. Southby
226 R. G. Lowndes and	964 F. W. Follows and J.
M. M. Callum	Bate
227 C. E. Brooman	991 J. Caplin
233 R. J. Green	1399 J. M. Hart
237 E. D. Ruston and W. W. Mills	1404 G. N. Mansfield
	1408 J. G. Tongue
238 J. D. Ellis 239 J. and J. Wilson and	1409 F. C. Knowles
G. Cryer	1431 H. Bessemer 1432 H. Bessemer
242 J. Pickering	1433 H. Bessemer
245 H. Law	1434 H. Bessemer
246 C. Gil	1435 H. Bessemer
248 C. Mather	1452 P. W. and W. Flower
249 T. Keeder	1479 C. W. Lancaster
252 T. Vaughan and J. W.	1499 R., J. J., and L. R.
Smith	Bodmer
257 R. Girdwood	1520 G. Allen

#### LIST OF SEALED PATENTS.

	Sealed Ma
3637	W. Soper
3652	H. A. Bonneville
3664	J. Tidmarsh
3666	E. Hely
8668	H. N. Maynard
8670	8. Pallant
8676	L. J. Marechal
3694	M. P. W. Boulton
	and J. Imray

28, 186	9.
3693	W. G. Ainslie
3697	F. Beech
3715	A. B. Berard
3726	A. M. Clark
3748	F. Meadows
3817	J. T. Grice
3863	E. P. H. Vaughar
3871	J. Jones
23	H. A. Bonneville

Sealed June	1, 1869.
3667 J. Alexander and J. Hill	3797 W. J. Murphy 3832 S. C. Lister
3675 D. Dorrity	3834 S. C. Lister
3682 C. H. Chadburn	3892 H. W. Hammond
3686 W. R. Lake	3896 J. Breeden
3688 H. Robinson	3915 B. Norton
3689 S. Hirsch	3941 G. T. Bousfield
3691 J. H. Johnson	83 J. H. Johnson
3692 J. G. Rollins	147 J. B. Whitehall
3696 J. S. Capelle	171 H. W. Hammond
3708 A. Masson	284 J. H. Johnson
3714 A. M. Clark	375 C. D. J. Seitz
3741 W. H. Pottle	491 F. J. Knewstub
3749 B. Needham	623 W. Simpson and A.
3753 A. G. Goodes	Gardner
3770 P. Kotzo	690 W. A. Gilbee
3771 W. H. Bailey	874 G. T. Bousfield
3799 The Honourable J.	946 G. T. Bousfield
Hay	1136 J. H. Johnson

#### PATENTS ON WHICH THE STAMP DUTY OF £50

HAS BEE	N PAID.
1466 J. T. King	1492 J. D. Whelpley and
1467 E. Bevan and A.	J. J. Storer
Fleming	1493 J. D. Whelpley and
1471 J. D. Whelpley and	J. J. Storey
J. J. Storer	1505 W. Bayliss
1475 D. Thomson and W.	1506 H. Schofield
Porter	1507 G. T. Bousfield
1491 J. Hall	1526 W. E. Newton

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1653 W. E. Newton 1637 A. Gilbey

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1299	1409	1441	1470	1485	1504	1521	1544	
1326	1411	1445	1471	1486	1505	1522	1546	
1333	1412	1447	1472	1487	1506	1524	1548	
1337	1413	1453	1473	1488	1507	1525	1550	
1365	1415	1455	1474	1490	1508	1526	1552	
1389	1417	1457	1475	1491	1509	1527	1554	
1391	1419	1459	1476	1492	1510	1529	1556	
1393	1421	1461	1477	1493	1511	1532	1558	
1395	1423	1463	1478	1495	1512	1533	1562	
1397	1427	1464	1479	1497	1514	1534	1564	
1399	1429	1465	1480	1498	1515	1535	1566	
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#### OF SPECIFICATIONS PUBLISHED LIST For the week ending May 29, 1869.

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3150	1 6	3194	0 4	3211	0 8	3223		3239		3253	
3151	1 4	3195	0 10	3212	0 4	3224		3241		3255	0 4
3153	1 0	3197	0 4	3213	1 0	3226		3242			0 10
3166	1 10	3198	0 8	3214	0 4	3228	0 4	3244	0 4	3258	0 4
3175	1 2	3201	0 4	3215	0 4	3229	0 4	3245	0 4	3263	0 4
3178	0 8	3202	0 4	3216	0 4	3230	0 8	3246	0 6	3264	0 4
3186	0 4	3203	0 4	3219	0 8	3232	0 4	3248	0 4	3265	0 4
3189	0 6	3206	0 4	3220	0 8	3236	0 4	3250	0 4	3266	0 4
3191	0 8	3207	0 4	3221	0 6						
3191	0 8	3207	0 4	3221	0 6						

NOTICE.—Having received communications from persons residing in the country to the effect that difficulties are occasionally experienced by them in obtaining copies of printed specification from the Patent Office, in consequence of the varying nature of the postage thereon, our readers are informed that upon receipt from them of particulars of the specifications they require, together with a remittance for the cost and approximate postage thereof, we shall be happy to procure and forward such specifications free of all further charge. Sums under Five Shillings may be remitted in postage stamps, for sums above that amount a Post Office Money Order should be sent, payable to ROBERTSON, BROOMAN, and Co., Patent Department, 166, Fleet-street, London, E.C., to whom all communications upon the subject should be addressed.

Science and Art.—A striking instance of the immense value a small piece of steel may acquire by the great power of skilled mechanical labour is the balance-spring of a watch. From its extreme fineness and delicacy, 4,000 weigh not more than one ounce, and exceed in value £1,000. A most interesting little work, describing the rise and progress of watchmaking, has been published by J. W. Benson, 25, Old Bond-street, and the City Steam Factory, 58 and 60, Ludgate-hill. The book which is profusely illustrated, gives a full description of the various kinds of watches and clocks, with their prices. Mr. Benson (who holds the appointment to the Prince of Wales) has also published a pamphlet on Artistic Gold Jewellery, illustrated with the most beautiful designs of Bracelets, Brooches, Earrings, Lockets, &c., &c., suitable for Wedding, Birthday, and other presents. These pamphlets are sent post free for two stamps each, and they cannot be too strongly recommended to those contemplating a purchase, especially to those contemplating a purchase, especially to residents in the country or abroad, who are thus enabled to select any article they may require, and have it forwarded with perfect safety.—[ADVI.]

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#### MECHANICS' MAGAZINE.

LONDON: FRIDAY, JUNE 11, 1869.

THE FRENCH ATLANTIC CABLE.

A FTER many months of hard labour and excessive work the A excessive work, the position now arrived at with regard to this enterprize may fairly be termed "the beginning of the end." Not only has the whole cable been manufactured, but it has also been shipped, and a portion is now on its way to its distant resting place. On previous occasions we have informed our readers of the formation and intentions of the company, of the description of cables to be used, and, in addition, have noticed shortly the progress made in the manufacture of the work. We purpose now to consider concisely the statistics of manufacture, the division of cable upon the several vessels forming the expedition, and the final arrangements for submersion.

The length it will be as well to recapitu-The entire length of cable from France to the United States is divided into two sections, a deep sea section between Brest and the island of St. Pierre, and a shallow water section between St. Pierre and Dux-bury Cove, near Boston. The entire length, including shore ends, the intermediate shore ends, and main cable, are:—Brest to St. Pierre, 2,788 knots; St. Pierre and Duxbury, 776 knots; total, 3,564 knots. The entire amount of insulated core was manufactured at the Gutta-Percha Works at Wharf-road, and was slowly commenced on September 14, 1868, and concluded on April 15, 1869, giving a weekly average of 120 knots. This must by no means be taken as the average capacity of the works; for during a portion of that time they were not at full work, and, in addition, manufactured a large quantity of insulated core—probably about 1,000 miles.

The St. Pierre and Boston section was manufactured entirely by Mr. W. T. Henley, at his works at North Woolwich, for the contractors (the Telegraph Construction and Maintenance Company), and was commenced on January 6 and finished on May 4. The entire length of this section, including the heavy shore ends, the intermediate portion, and the main cable, each of which represents a large amount of work, when we consider the serving, the sheathing, and the outer protection of hemp and asphalte, was com-pleted at the rate of 43 knots per week. In work of this nature, there are various ele-ments which introduce delay, and, consequently, the average we have given is far below what sheathing works are capable of. But during the above-mentioned time there were many miles of other cable manufactured by Mr. Henley. However, the maximum amount of the cable manufactured by him during one week amounted to 90 knots

The major and more important portion of the contract was manufactured entirely by the Telegraph Construction and Maintenance Company at Greenwich. This consisted of the section embracing the deep sea portion between Brest and St. Pierre, and represented a length of 2,788 knots. The commencement dates from October 21, 1868, and the last portion was completed on the 2nd inst., giving an average rate of construction of about 85 knots per week. The maximum rate of manufacture was 128 knots per week, The maximum and it was actually maintained at the rate of 120 knots for some time; but when we consider the difficulty of getting material to start with, and many other points, the average rate of progress is most satisfactory. But the principal point to be considered is this, irrespective of the weekly progress, that the contract was made for the completion and shipment of the cable by a certain is considered. "Scanderia," and 450 miles more being payed out, the remainder, including the shore end at Duxbury Cove, will be completed by the tion and shipment of the cable by a certain "Chiltern." The length of the entire cable (secretary), &c., &c.

date, and that the contract has been most faithfully fulfilled. Such a fact, we maintain, is far more satisfactory and congratulatory than a mine of statistics.

A cable such as the present represents an enormous amount of work, especially if we consider some of the details. The strands of copper wire represent 25,000 miles; the weight of the insulating gutta-percha amounts to over one million pounds, put on in three separate coatings; the strands of Manilla hemp (irrespective of jute) represent a length of nearly 140,000 miles, the hemp and jute combined giving a total weight of 1,800 tons; the exterior protection of Clark's compound represents a weight of 650 tors of tar and silica; and finally, the iron wire gives a total length of over 37,000 miles, and a weight of nearly 4,700 tons, giving for the entire cable a total weight of 8,250 tons. It is when we consider such details, that the vastness of the work can really be fairly comprehended, and, under such circumstances, it is only but right and honest that due praise and acknowledgments should be given to the private companies that undertake and carry out such vast enterprises. It is the more incumbent in us to do so, when we reflect that in this particular work we alone maintain our prestige, and preserve our speciality against all comers. It is no idle boast that in this particular manufacture, we stand unrivalled. Although we may have to compete with other foreign and deserving rivals in various manufactures, yet with regard to the speciality of submarine cables, we are essentially alone. Look where we will, wherever there is an important or any submarine cable laid, it is due entirely to British manufacture, and, principally, as in the present case, to British enterprise.

The vessels employed in the expedition are The vessels employed in the expedition are the "Great Eastern," the "Scanderia," the "William Cory," and the "Chiltern," the entire amount of cable being apportioned amongst them. The "William Cory," with amongst them. The "William Cory," with the shore ends for St. Pierre, and a portion of the Boston section, has already left; the "Great Eastern," with almost the entire amount of the Brest section, leaves her present anchorage on the 12th, for Portland, and it is expected she will take her departure from there on the 18th, after receiving about 4.000 tons of coal.

The heavy shore end at Brest will be laid by the "Chiltern," for a distance of about 5½ miles; the "Great Eastern" will splice on her cable at that point, and pay out 21 miles more of heavy shore end, and will then go on to the intermediate size cable, which will carry her into deep water, and where the light deep sea cable will commence. The greatest depth is above that of the existing Atlantic cables; but the present cable is almost identical as to its mechanical construction with the former, so there is but little to fear as regards the safety of paying out. The operation of paying out is anticipated to occupy about 18 days, during which time she will be accompanied by the "Scanderia" and "Chiltern," and the cable on board the "Great Eastern" caole on board the "Great Eastern" will during that time, all be payed out, bringing her close to the island of St. Pierre. The shore end from St. Pierre and the intermediate portion will be laid by the "William Cory," and the final splice of the section completed in her. Having completed herallotted portion, the "Great Eastern" will immediately return to Sheerness. The Brest section lands at the north-east portion of the island, communication being made with the town of St. Pierre by an underground line, which is continued across the island to the southern extremity where the United States section lands. heavy shore end for this section will be laid by the "William Cory," as well as the intermediate and a portion of the main cable; from her the operations will be shifted to the

is so great that its shipment in different vessels is absolutely necessary for its speedy submersion; this involves the necessity of the entire engineering and electrical staff shifting from one ship to another. The whole of the operations are under the charge of Sir. Samuel Canning, who brought the existing Atlantic cable to a successful issue. Assisted generally by the same efficient staff, we may fairly anticipate an equal amount of success for the present cable.

The electrical arrangements are entirely under the direction of Mr. Willoughby Smith, and will be based on his special method of maintaining a constant test, while signals can, at the same time, be transmitted from ship to shore or vice versa—the system that was adopted in the 1866 Atlantic cable, and in all cables submerged by the Telegraph Construction and Maintenance Com-Mr. J. C. Laws will, it is stated, assist Mr. Smith throughout the expedition, and a conjunction of such electrical experience promises well for the success of the cable.

The entire superintendence of the cable on the part of the company has been conducted with every care and skill by their engineers, Messrs. Latimer Clark, H. C. Forde, and Fleeming Jenkin, assisted by a large staff of well-known electricians and engineers. paying out and final arrangements will also be carried out in their presence, Messrs. Clark and Forde accompanying the expedition in the "Great Eastern," while Mr. Fleeming Jenkin will remain at Brest, so as to be prepared for whatever might happen; and the result we most anxiously look forward to, is the immediate and successful issue to an undertaking so vast—an undertaking French in title, but whose success will be entirely due to English capital and English enterprise.

A grand banquet was given on board the "Great Eastern" yesterday, by the Telegraph Construction and Maintenance Company, upon the occasion of the completion and embarkation of this cable, and at which were present a number of gentlemen interested in the undertaking, as well as our leading electricians and telegraphic engineers. We understand that as soon as the "Great Eastern" has completed the task of laying this cable, she will return to Sheerness, and commence preparations for receiving the Anglo-India cable, which is intended to be laid between Suez, Aden, and Bombay, and is of the same length as the French Atlantic cable. It is also being made by the Telegraph Construc-tion and Maintenance Company.

#### THE SOCIETY OF ENGINEERS.

FOR several years past the members of the Society of Engineers have made it a practice to visit public and private works of note in and around the metropolis, as well as some of our leading engineering establish-ments, during their vacation, which extends from May to October. It has been our pleasure to accompany them on most of these visits, which have thus been the means of our placing much useful information before our readers. The first trip of the series for the present year was made on Friday last, when the members and associates of the Society and their friends visited the Limehouse Basin Improvement Works and the They West India Docks Extension Works. afterwards proceeded to the London Engineering Works at Millwall, which they inspected. There were present upon the occasion, the President (Mr. Frederick William Bryant), Mr. William Henry Le Feuvre (past president), Messrs. J. Henry Adams, James Hendry, Edward J. Leonard, and William Macgeorge, (members of council). Amongst the members were Messrs. F. E. Houghton, Thomas Car-gill, J. R. Baillie, J. Westwood, John Black-

Before describing the Limehouse Basin Improvement Works, we will give a brief history of the circumstances which necessitated them. In 1802, a canal from Paddington to the London Docks was projected, but was afterwards abandoned. In the year 1811, plans and estimates for a canal from Paddington to Limehouse, to be called the Regent's Canal, was proposed; nothing came of it until the following year, when an Act for making and maintaining a navigable canal from the Grand Junction Canal to the Thames at Limehouse, to be called the Regent's Canal, passed on July 13. The excavation was commenced in the Regent's Park on October 7 of the same year, and on August 1, 1820, the canal was opened throughout. The basin and entrances at Limehouse have, from time to time, been improved, but of late years they have been so totally inadequate for the requirements of the traffic, especially for the steam colliers, that the Company, acting under the advice of their engineer, Mr. Edwin Thomas, M.I.C.E., applied to Parliament in 1865 for powers to make a new entrance from the river, and to enlarge the dock with wharves, warehouse space, &c. Plans and estimates were at once prepared, the Company carrying out the works themselves under the immediate superintendence of their engineer, Mr. Edwin Thomas, and their resident engineer, Mr. John Blackbourn, M.S.E. The foundation stone was laid by Mr. William Parker, the chairman of the Company, on October 16, 1867, particulars of the ceremony being recorded in the MECHANICS' MAGAZINE at the time. It is expected that the works will be opened for the trade in about another month: they will have cost, with the required extra land, about £200,000. The docks are situate close to Stepney Station, and a steamboat pier is shortly to be erected with public stairs at the docks.

The works consist of a new ship entrance lock, divided into two compartments by means of three pairs of gates, the outer lock being 120ft. long, the inner 230ft. long, having a width at coping level of 60ft. 7in. The outer gate sills are 28ft. below Trinity high-water mark, the inner one 26ft. The gates are of wrought iron, the lower half being watertight, with cast-iron heel posts fitting into granite hollow quoins, no timber being used at the quoins. The mitre posts are of greenheart; the granite sills are faced with oak. There are six sluices for filling and emptying the lock chambers, each 7ft. by 4ft., and are fixed in large chambers in the gate recesses; ready access is thus afforded for examination and repairs. For flushing the bottom of the lock, there are 14 discharging culverts, ten of them, at an angle of 45deg., pointing towards the outer end of the lock, the others, at an angle of 63deg., pointing in the opposite direction. Near the river end of the lock, a swing bridge crosses on the skew. This bridge has a total largeth of 120ft. bridge has a total length of 129ft., and a clear width of 25ft. The whole of the girders are hid beneath the roadway, which is laid with cast-iron chequered plates. The bridge, with ballast, weighs about 360 tons, and is beautifully balanced. The bridge, gates, capstans, sluices, and cranes are worked by hydraulic power, the machinery for which has been supplied by Sir William Armstrong and Co., who have also constructed the whole of the ironwork.

In the river, a new quay wall, 220ft. in length, has been built; the foreshore of the river opposite this wall is to be deepened to 26ft. below Trinity high-water mark. At the west end of this wall, and east of the new entrance, a timber jetty is to be constructed, which will extend 54ft. into the river. Arrangements are made for sluicing any mud which may accumulate at the back of this present barge entrance to the new ship lock, and is 370ft. long. The walls are of solid brickwork in blue lias, faced with Portland as collectively, a great desideratum. A very prevails at the earth's surface, and, at other

cement with 2ft. of concrete at the back. The invert of the lock is 3ft. thick, laid in cement—the top course on end—with a foot of cement concrete under it. The lock walls are faced with Staffordshire blue bricks, and the dock and river walls are protected with cast-iron fenders. A coffer dam, 520ft. in length, has been erected along the river front, and consists of two rows of 13-inch sheeting piles, 6ft. apart, with counter piles every 12ft.; the dam is well strutted and bolted; at Trinity high-water there is 25ft. 6in. head of water to The dam is protected from the shipping by fender piles and floating booms. The 6ft. space is filled in with puddled yellow clay. To work the machinery, a new 80-horse power engine and three boilers are being erected; a tank to hold 50,000 gallons is placed over the boiler house. In this work, which has been well designed and equally well carried out, there 200,000 yards of excavation, of which 180,000 yards will be taken off the ground. 12,000,000 of bricks, 1,060 tons of granite, 3,700 tons of Bramley Fall, and 12,000 yards of concrete. The granite was supplied by Mr. Goodyear from the De Lank Quarries, Bod-min, Cornwall. The Bramley Fall by Messrs. Freeman and Son. The timber for the coffer dam by Messrs. Burt, Bolton, and Haywood. The whole work is a creditable example of dock engineering.

From the Limehouse Basin Works the party proceeded to the West India Dock Extension Works, where they were received by Mr. E. J. Leonard, M.S.E., the engineer of the dock company, and Mr. W. Hickson, the superintendent. Mr. Hawkshaw is the engineer for these works, which are near completion. The basin affords an area of 26½ acres of water, and with its jetties and warehouses about to be erected, will form a very important addition to the company's works. Mr. George Wythes is the contractor for the work, which is being carried out by

Mr. John Baldwin.

After having visited the foregoing works, the party adjourned to the yard of the London Engineering and Iron Shipbuilding Company, the managers of which, Messrs. Westwood and Baillie, kindly conducted the Society over their establishment, pointing out in detail the works of interest in their yard. Amongst the more prominent, we noticed the application of wrought-iron blades to screw piles. An angle-iron is riveted to the blade, following the curve of the screw the entire diameter of the pile; it is then fastened to the pile itself by means of set screws, which can be removed at pleasure. This, in itself, is a most valuable invention, not only in the simplicity of its construction, but in its easy and compact application for shipment, existing cast-iron blade and boss, together forming a most unwieldly and weighty article; besides its great liability in carriage to breakage. With the wrought-iron piles, we noticed also a very neat socket joint, the invention of Mr. Westwood, jun., for connecting long lengths of piles. This we shall take an early opportunity of placing before our readers in a more detailed form. Amongst other things, we noticed the application of curved corrugated plates for the purpose of forming a platform for bridges, thus obviating the necessity of cross girders. Two angle irons are riveted to the bottom flange of the main girders, and are carried across transversely; small tie rods are carried up from them, and connected to the plates, to prevent any tendency they might have to buckling, though, we were assured, that in bridges of small width, this precaution was quite unnecessary, the corrugated plates possessing in themselves sufficient rigidity to overcome any tendency they might have in that direction. curved corrugated plates can also be applied to the floors and roofs of buildings for India,

simple and effective means employed by Messrs. Westwood and Baillie, for obtaining the outline of dock entrances, when the tide was in, seemed to give general satisfaction. This we also hope to be enabled to give to our readers at an early date. A socket joint for cast-iron columns, in the place of flanges and bolts, as now employed, was next pointed out, with the examples on which the same test had been employed, to obtain the relative value of the one over the other; the one with the bolt holes in the flanges was fractured from end to end, whereas the one with the socket joint was as perfect as on the day it was taken from the foundry. Having made a tour of the shops, and inspected the various works in progress—amongst others, the new roof for the Great Northern Railway, at King's Cross—the members took their departure, gratified by the kindness with which Messrs. Westwood and Baillie had conducted them through their works. We have also to thank Mr. Packman for having afforded us the explanation of the construction of the various objects of interest. On leaving the London Engineering Yard, the members and their friends proceeded to the Brunswick Hotel, at Blackwall, where they dined together, and thus pleasantly brought to a close an interesting and instructive dav.

#### ON THE LAWS OF WEATHER.

KNOWLEDGE of the laws and prin-A ciples which govern the movements of the atmosphere, and apparently are the most concerned in the phenomena of weather, must be requisite to enable anyone to understand the basis of weather forecasts. propose to summarize the recognized principles of weather changes. This was a task which Admiral Fitzroy set himself to work out in "The Weather Book"—an extraordinary performance, whether we regard the subject matter or its mode of treatment. Incoherency of material and insufficiency of explanation condemn the work to neglect. The truth is, he was by no means a lucid writer. Moreover, the novel application of daily meteorological observations to the prediction of weather, which he had recently originated, was uppermost in his mind while writing, and was yet in a crude undeveloped state. He had commenced forecasting without clear perception and well conceived ideas of what could or might be accomplished. His undertaking was altogether an experiment, and such he himself termed it. Hence he necessafily corrected his impressions and his knowledge as he progressed and gained experience. He had satisfied himself of the feasibility of his scheme; but without any tentability of his scheme; but without any tentability of his scheme; tive trial, he at once made his forecasts of weather public. This accounts for the numerous and varied explanations which he sent to the newspapers to refute objectors or satisfy sceptics.

The theory of the circulation of the atmosphere recognizes two grand currents of air, blowing respectively from the equatorial and the polar regions of the earth. Hadley was the propounder of this theory, which has stood the test of all subsequent research and observation. It explains why equatorial winds come from the south-west, and polar winds from the north-east, in the northern hemisphere; why the equatorial come from north-west and the polar from south-east in the southern hemisphere. The polar current, leaving a region geographically cold, and advancing into warmer latitudes, always feels cold, and is usually dry and heavy; while the equatorial current, having a reverse course, is warm, and often moist, and light with vapour. These characteristics of the two vapour. primary wind currents are experienced gene-

times, the equatorial, and one or the other may be superposed at any given region. The place of contact, whether these currents flow side by side or one above the other, is not well defined, but is the seat of veering winds and the birthplace of storms. Regarding the north-east and the south-west as the normal winds of the north temperate zone, winds from all intermediate directions are found to bear characteristics more or less common to both normals. The place of contact or intermingling is usually marked by precipitation of rain, hail, fog, or snow, resulting from the cold of the polar current condensing the vapour borne by the equatorial current. The weather features of the polar current are generally high barometer, low thermometer for the season, dryness and clear sky; those of the equatorial are a more frequent low state of the barometer, high thermometer, rain or humidity, and overcast sky. Thus, Bacon's sayings—"Every wind sky. Thus, Bacon's sayings—"Every wind has its weather," and "North wind cold, east wind dry, south wind warm and often wet, west wind generally rainy "—have been con-

firmed by subsequent philosophy.

The chief motor of the air is undoubtedly heat, but it is not easy to trace its connection with the changes of wind, in regard to direc-tion and force, although a direct estimate of the statical forces which control the dynamical force of the wind is very much needed. Such an estimate, in the present state of science, is best obtained by means of barometers at places about 100 miles or so apart. Whenever, from any cause, a gradual lightening of the atmosphere occurs over an area of some hundreds or thousands of miles of the earth's surface, shown by barometers there falling gradually, an influx of air must of course take place to restore equilibrium. Now, it is a remarkable fact, that the direction of this flow is indicated by the motion of the mercury in the barometers, and the relation between the wind and the atmospheric pressure is such that the wind comes nearly at right angles (with tendency towards the place of deficiency), to the line joining the place of highest and the place of lowest barometer, the place of least pressure being on the left of the wind's course. This comprehensive law, for the winds of the northern hemisphere (left having to be altered to right for the southern), was first proved to be generally applicable to all winds by Dr. Ballot, of

The intermingling of polar and tropical winds causes condensation of vapour and also electrical action. These processes set free sensible heat. On the other hand, evaporation renders heat latent, and, therefore, causes chilliness. Heat thus rendered alternately latent and active, is virtually a statical force, and must affect the dynamical condition of Thus the moving force of wind must the air. result from disturbed equilibrium of atmospheric pressure, from evaporation of water, condensation of vapour, electrical action; and besides the direct influence of solar heat, there may be other agents active beyond our earth, as the attraction of the sun, moon, &c., of which, however, nothing definite is known. 'The polar current when uppermost may produce a chilling effect, and cause the lower and warmer current to part with some of its moisture; and, where the tropical current is thrown into the higher and colder region of the atmosphere there rain must happen. Thunderstorms are always the result of the conflict of two dissimilar currents of air. The contact may take place vertically, horizontally, or more or less so. When it occurs under the former circumstance, the progress of the storm marks very closely the advance of the pre-dominant wind. Under the latter circumdominant wind. Under the latter circumstances, the battle cannot be charted down, and we are left to conjecture the state of

ence of opposing winds for the occurrence of thunderstorms, has been strangely overlooked, although it is recognized even in the Psalms -"He causeth the vapours to ascend from the ends of the earth, He maketh lightnings for the rain, He bringeth the wind out of his treasures." Milton, in "Paradise Lost," savs:-

Justling, or pushed with winds, rude in their shock, Time the slant lightning; and Dryden's Virgil has this passage on the winds :-

When the winged thunder takes his way From the cold north, and east, and west, engage, And at their frontiers meet with equal rage, The clouds are crushed, &c.

Mr. Glaisher, the veteran meteorologist, observed, during a balloon ascent, made in the middle of January, a strong current of air from the south-west over our country, having a depth of nearly one mile. current continued many days. "The southwesterly current thus observed," says Mr. Glaisher, "is of the highest importance, as bearing upon the very high mean temperature we experience during the winter, so much higher than is due to our position on the earth's surface; and it is highly probable that to its fluctuations the variations of our winters are due. . . . So long as these winds blow, we have no frosts or intense colds; but the moment the wind changes during the winter to an easterly, north-easterly, or northerly direction, we have both frost and snow, and more or less intense cold. The south-west winds in their course meet with no obstruction in coming to us, but they blow directly to us and to Norway over the Atlantic; and hence we enjoy a much milder climate during winter than any other lands not similarly situated with regard to such

#### GREENWICH OBSERVATORY.

AST Saturday witnessed a gathering of philosophers in a scientific establishment, where they might revel in all the luxuries of the most refined science, elaborated to the highest pitch attainable by means of modern mechanism. The occasion was the annual official visitation at the Royal Observatory, Greenwich, by the Board of Visitors, among whom are the presidents of the Royal and the Royal Astronomical Societies, with five fellows of each body, together with the holders of astronomical chairs at Oxford and Cambridge. According to custom, a large number of scientific men met, by invitation of the chairman of the Visiting Board, to inspect the instruments and appliances unofficially. An extraordinary number of spots have lately appeared upon the sun, and these afforded great interest to the visitors, who had an opportunity of viewing them with the most powerful instrument in the observatory—an equatorial refractor of 13in. aperture and 17ft. focus. As usual upon similar occasions, the Astronomer Royal presented to the visitors his report upon the labours of the observatory during the past twelve months. This report is full of interesting matter respecting the valuable apparatus there in use. Having been favoured by the Astronomer Royal with a copy, we are enabled to place the principal points of its information before our readers.

Firstly, with regard to the buildings and grounds, we find that the middle room of the south-east dome is now completely fitted up as a chronometer room, with ample accommodation of tables for chronometers, with large chronometer oven, and with exposed railed outhouse for chronometers to be placed in the open air. The scale of all these permits the chronometer boxes to be placed, if neces-

which has been used as a temporary observatory, is at present planted as a shelter for detached telescopes and telescope stands. is intended as soon as the great shed has been removed, to erect a shed in its place, for more convenient protection of these telescopes and stands. No alteration has been made in the magnetic observatory. The precautions which the observatory staff have learned to take, and which are made effective by the incessant attention of Mr. Glashier, have enabled them to control the temperature generally without the actual change of the walls of the building. Still it is found that the effect of the sun's radiation in the south-west re-entering angle will sometimes make itself sensible; and at the present time a large wooden screen is mounted there to

ward off the heat.

At the last visitation, Professor Airy pointed out to the Hydrographer and the Director of Works to the Admiralty the too close proximity of the various buildings on the magnetic ground, and the increasing necessity for an extension of the domain of the observatory. The Professor suggested that the eastern boundary of the grounds should be extended 100ft., that the southern boundary should there be set off at right angles, and that the western boundary should be continued to meet it. The warrant for the annexation of this space to the observatory grounds received the royal signature on December 8, 1868. The new depôt for the printed productions of the observatory was in progress of construction; but in anticipation of the extension of territory, Professor Airy had so arranged its frame that it could be transported to a new position with little trouble. The new ground was extremely uneven, but by a considerable amount of earthwork and by erection of substantial retaining walls in some parts, he has been able to arrange it in two horizontal planes at different elevations. The depôt is transferred to its position in the new ground, and its internal fittings are advancing. The foundations and underpinning for the great shed are completed, and as early as possible it will be shifted from its present place on the magnetic ground to that new site. The positions selected for both these buildings are close to the new southern boundary. Great advantage will be gained to the magnetic ground, and great freedom for many purposes, by this extension of the enclosure.

No important interruption is reported as having taken place in the external galvanic communications. The courses of the wires adapted to the registration of spontaneous terrestrial galvanic currents have been entirely changed. The lines to Croydon and Deptford are abandoned, and for these are substituted a line from Angerstein Wharf to Lady Well Station, and a line from North Kent Junction to Morden College Tunnel. At each of these points the communication with earth is made by a copper plate 2ft. square. The straight line connecting the extreme points of the first station intersects that connecting the two points of the second station, nearly at right angles, and at little distance from the observatory. Great length, however, is added to the wires (apparently with no inconvenience) by the necessity of following the railways to their junction, in order to lead the wires through the projections apparatus in the through the registering apparatus in the observatory. The question of railway through Greenwich is still unsettled. After abundant consideration of this question, seeing that there is no necessity for carrying London-Woolwich passengers through Greenwich, that the construction of the great sewer will render a thorough railway far more annoying to the town of Greenwich than it might have been formerly, and that every facility for easterly communication may be given to Greenwich and to Deptford at very affairs. The presence of the upper current is shown only by the motion and visible features of clouds, most notably so by the cirrus and cirro-cumulus. The necessity for the existObservatory, it would be most advantageous to all parties (including the South-Eastern Railway Company) to lay aside all thoughts of a line through Greenwich.

Turning to the astronomical instruments, we find that the transit circle is in perfect order. A few small iron chips in the telescope tube gave some trouble; but, at the first opportunity, they were extracted by the insertion of magnets, and there has been no further annoyance. The screw movements for focal adjustments, and the jointed sliding caps for the perforations in the central cube, have been found very convenient. The reversed telescopes, for reciprocal observation through the perforated cube and for carrying the wires which are observed as meridian marks by the transit circle, when proper care is taken for focal adjustment, give no trouble in the nature of systematic discordance, and are in all respects perfectly efficient. The are in all respects perfectly efficient. The proposed high-class interior thermometer has been mounted in a position in which it may be expected to indicate fairly the temperature of the air near the object glass. Several foreign astronomers have considered this important, as they think that the computation of atmospheric refraction is more consistently accurate if it is referred to the interior thermometer than if it is made to rely on the exterior thermometer. The clocks generally are in good order. Two ounces of quick-silver were added to the bulb of the transit clock pendulum, and it does not appear to require more. Lime is used to keep the air in the head of the clock dry; it is changed once each month. A new clock by Messrs. Dent is in progress. It is to be constructed with an escapement analogous to the chronometer escapement, which produces maintaining power with a smaller amount of friction than any other. Professor Airy has arranged a method of altering the rate without stopping or touching the pendulum, by a sliding weight upon the crutch rod. He is endeavouring also to prepare a construction for altering the thermal compensation through a small extent, without touching the pendulum. He has not succeeded to his satisfaction in planning a barometrical compensation. It is proposed to place the clock in the magnetic basement, where the temperature is more uniform than in any other of the rooms, and to lead galvanic wires from it to the transit clock and other clocks.

The south-east equatoreal is in excellent condition. Very lately, the revolving arms of the re-action machine of its clockwork burst (the internal pressure of the water amounts sometimes to 50lb. per square inch), and during the absence of these arms, which describe a circle of about 15in. diameter, for repair, the arms originally constructed by Messrs. Ransomes, which describe a circle of 20in. diameter, have been substituted. With full pressure of water, the motion is now free from some very minute inequalities which could be discovered with the smaller arms. The motion of this clock, in the combination of definiteness and smoothness, is probably the most perfect in existence. The question of dependence of the measureable amount of sidereal aberration upon the thickness of glass or other transparent material in the telescope (a question which involves, theoretically, one of the most delicate points in the undulatory theory of light) has lately been agitated on the Continent with much earnestness. Professor Airy has calculated the curvatures of the lenses of crown and flint glass (the flint being exterior) for correcting spherical and chromatic aberration in a telescope whose tube is filled with water, and has directed the preparation of an instrument carrying such a telescope. The Pro-fessor has not finally decided whether to rely on zenith distances of y Draconis or on rightascensions of Polaris. In any form, the experiment will probably be troublesome.

that, on November 20, 1868, 89 Herculis, a star of the 6th magnitude, N.P.D. 64deg., was observed with the transit-circle, when passing 1hr. 50min. after the sun; and, it would appear from the Assistant's report, was observed without difficulty. The number of observed occultations of stars by the moon is four; all disappearances. The number of phenomena of Jupiter's satellites is 29. The transit of mercury on November 4, 1868, was observed by six observers; Mr. Stone using the S.E. equatoreal. The atmospheric circumstances were favourable; and the singular appearances usually presented in a planetary transit were well seen. These appearances had been observed at the Royal Observatory in a preceding transit of Mer-cury (November 8, 1848), but they had escaped from memory; and we must regard it as a fortunate circumstance that, when preparations for observing the transits of Venus in 1874 and 1882 are in agitation, we have had an opportunity of seeing, though on a somewhat different scale, the characteristic difficulties of the observation. Mr. Stone has attached to the south-east equatoreal a thermo-multiplier, with the view of examining whether heat radiating from the principal stars can be made sensible in the Observatory instruments. The results hitherto obtained are encouraging, but they show clearly that it is vain to attempt this enquiry except in the most superb weather; and there has not been a night deserving that epithet for some months past. Mr. Carpenter has made, with the south-east equatoreal, three drawings of the lunar spot Linnæus, three drawings

Jupiter, and two of Winnecke's Comet.
Continued attention has been given by Mr.
Glaisher to the equalization of the temperature of the magnetic basement, and with general good success. From October to May there is no difficulty in keeping the temperature between 59deg. and 62deg. From June to September the difficulty is much greater; on a solitary occasion, the temperature rose to 72deg. The daily change is kept down to 3deg., and in the great majority of days it does not exceed 1deg. With the system in use at the Observatory of inclosing the magnets in double boxes, every box-side being gilt within and without, the corresponding changes of temperature about the magnets are very small. This system of inclosure deserves special notice; it appears absolutely to suppress all currents of air about the magnets, and almost all causes of accidental vibration and the magnets, under the ordinary terrestrial disturbances, seem to take up their positions

without any further fluctuation. The upper declination magnet; the theodolite by which the collimator of the upper declination magnet is viewed, and which is also used to observe circumpolar stars; and the lower declination magnet, which carries the concave mirror by photographic trace is made which a photographic trace is revolving photographic barrel, are all in good order. The horizontal-force-magnet perfectly efficient. The on and its apparatus are perfectly efficient. The vertical-force-magnet is in an excellent state; its knife-edge was revised in the winter by Mr. Simms; it has exhibited no dislocations of photographic curve in the records of last

The great magnetic storm of April 15 was admirably recorded on all the instruments, but on none was it registered in greater beauty than on the vertical-force. The disturbance in that element was the greatest ever registered. A magnetic storm occurred, accompanying the aurora borealis, of May 13, comparable with that of April 15, and was equally well recorded. Professor is contemplating, as possible, a cting tracing of hour-lines in the self-acting tracing of hour-lines in the photographic sheets, but he has not yet arranged the plan. No further experiments have been made for determining the thermo-Under the head of astronomical observa- metrical corrections of the horizontal-force The issues of chronometers to the Royal tions, it may be interesting to place on record and vertical-force magnetometers. The dip-

instrument and its needles have been revised by Mr. Simms. The action of this instrument is now so delicate and so certain that it is proposed to recommence the observations at different hours of the day, which were commenced, but brought to a close many years ago. It has been the object, in establishing the plant of meteorological instruments, at Greenwich, in the first place, to introduce photographic self-registration where possible this applies to barometer and wet and dry bulb thermometers), secondly to introduce mechanical self-registration (namely, for pressure, direction, and speed of wind, and for rain fall), thirdly, to provide ample means of eye-observation (for barometer, ordinary thermometers, wet and day; thermometers at different depths in the ground; thermometers in the Thames; and seven pulviometers at different elevations). All are in good order, and have worked well through the year.

In stating last year the results obtained

from the comparison of the magnetic disturbing forces due to the spontaneous galvanic currents on seventeen selected days in the years 1865, 1866, 1867, with the magnetic disturbances actually observed, Professor Airy notified his intention of extending the comparison to all the disturbed days occurring during the use of the galvanometer apparatus in those years, and also of examining the un-disturbed days. In carrying out this plan, first, the comparison has been extended to thirty-six additional disturbed days (making fifty-three in all), and, for five of these, the curves of comparison have been drawn. The character of the results derived from the comparison is sensibly the same as that obtained from the seventeen days. Secondly, the earth current indications for all the undisturbed days have been reduced, and their results laid down in curves; their dimensions, when laid down on the same scale which makes galvanic disturbances comparsmall, and follow a law totally different from that of ordinary diurnal inequalities, having greater resemblance to the curve, or, rather, line, which would best represent luno-diurnal inequalities. The important negative result is thus obtained, that the ordinary diurnal inequalities cannot be explained by the spontaneous galvanic currents. The adjustment constants are determined for the meteoro-The adjustment logical instruments and are applied to the eye observations to the present time; and the thermometer results are reduced to the stage of exhibiting dew point and degree of moisture. The record sheets of the two anemometers are perfect in themselves. photographic sheets of the barometer and dry-and-wet thermometers are furnished with time scales to the end of 1868, and the new base line for barometer is prepared to the end of 1867. The number of rotations of the vane in 1868 is + 20.4. This record interrupts the law which had appeared to prevail for a long time, and which gave a periodical recurrence of numbers in seven years.

At the present time, the number of chronometers on hand at the Greenwich Observatory is 188, namely, 111 box chronometers, 23 pocket chronometers, and 8 deck watches. the property of the Admiralty; and 46 chronometers, the property of chronometer makers, on the annual competitive trial. The authorities have tried and have delivered to the Admiralty a chronometer to be used in trial of the speed of ships, and they have tried and reported on two chronometers intended for use in heaving the log. The system of valuation and examination is founded upon the practice of rating all the chronometers, the greater part daily and others weekly, both in the open chronometer room, whose daily range of temperature rarely exceeds 2deg., and in the oven, where a temperature not exceeding 90deg. is steadily maintained.

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sending them with balances wedged in hampers under the observatory seal by ordinary railway conveyance to the Admiralty agents at the outports. Scarcely an accident has occurred in this transmission. It is desirable, however, that some apparatus should be arranged by which the chronometer balance can be securely grasped, without the necessity for inserting cork wedges. The experience of the use of bright white steel springs instead of blue springs, as preservative against rust, is favourable, but not decisive. The error number for chronometers under trial in the year 1868 is larger by an accidental quantity than that in the last two years; it is much smaller than it was five or six years ago.

We have now taken those points in the report of the Astronomer Royal which are of chief interest to our readers. The selection, however, has not been easy where all is so interesting. We cannot conclude without noticing the personal staff by which Professor Airy is surrounded and aided: -Mr. Stone is the first or confidential assistant, and is not limited in his employment to any special class; Mr. Glashier superintends the magnetical and meteorological department; Mr. Dunkin manages the altazimuth generally and the adjustments of the meridional instruments; Mr. Ellis has the sole charge of the time department, chronometers, and time signals; Mr. Criswick is responsible for the reductions of transit circle observations in zenith distance; Mr. Lynn superintends the mass of reductions effected by the supernumerary computers, in which the transit reductions are included; Mr. Carpenter takes the care of the equatoreals, but is principally occupied with the library, the manuscripts, distribution of the printed observations, and the general literary administration of the observatory, which is very heavy; Mr. Nash assists Mr. Glashier in the magnetical and meteorological department. Professor Airy records that all these gentlemen have worked honourably, zealously, and well, in the cause of the observatory and of the sciences to which it is devoted.

#### SCIENCE FOR THE PEOPLE

THERE was a time when the knowledge of scientific truths was confined to a very few, and those few practically illustrated the axiom that "knowledge is power." Power to them it undoubtedly was; power of an oppressive and tyrannical character. The bigoted votaries of science drew a veil of impenetrable mystery around her earlier germinations, keeping the mass wondering ignorantly on in mingled fear and admiration. By degrees, the barriers of exclusiveness, set up by those who had obtained an insight into the arts and sciences, began to yield to the demand for knowledge, and, in time, the glorious light of science could no longer be kept hidden, but spread itself over many lands. Civilization taught men that "knowledge was power" only when well employed, so that they began with one accord to place their various experiences before the world, and thus promoted the healthy advance of nations. Teachers of the people arose in the land, and the people having once tested of land, and the people, having once tasted of the spring of knowledge, thirsted for more; and they have been well satisfied, for the scientific education of the mass has been the earnest study of many men. None, however, have been more practically zealous in this cause than Professor Pepper, whose name stands foremost as a teacher of the highest scientific truths in a popular form. The Royal Polytechnic Institution—the scene of his labours for many years past—bears witness to his success in instructing and, at the same time, amusing the public, and all with the purest science. Now, a man, who can command such audiences as Professor Pepper does, undoubtedly possesses a facility for Warne and Co. Bedford-street, Covent-garden. New York: Scribner, Walford and Co. 1869. the purest science. Now, a man, who can

imparting knowledge in a form which is at once striking and agreeable to all. And this requires special tact and good sense as well as talent, seeing the multifarious diversity of minds to which he has to appeal. The Pro-fessor has this talent and this tact, and we are glad to see that he has applied it in a literary direction. Professor Pepper is already known as a writer upon natural philosophy, but his earlier works were written for the vouthful student. The volume now before us is an advance upon those, and conveys scientific information to such readers as may have neither the time nor the inclination to study the more recondite authors in such a form as is at once instructive and interesting. In fact, our author transports himself, with all his happy ideas and illustrations, from the lecture theatre to a volume containing nearly 700 pages of letterpress interspersed with about 600 engravings. The subjects treated of embrace light, heat, electricity, magnetism, pneumatics, acoustics, and chemistry, which are considered in all their varied branches, their practical applications being illustrated. The various natural phenomena are explained with brevity and simplicity, and illustrations are given, by means of which the general reader is at once made familar with facts and principles, which otherwise would be but "dark sayings" to him. The author introduces here and there portions of papers, by our veterans of science upon the subjects of which he treats. Thus, amongst others, we find the names of Faraday, Daniell, Wheatstone, Brewster, Tyndall, Crookes, Siemens, Noad, Spillar, &c., whose writings are judiciously quoted in their own words, and are not hashed into a jumble by the pen of a plagiarist. Those who have been startled by the shadowy apparitions at the Polytechnic will here find them all accounted for and explained. Here, too, they will find reproduced many of those interesting experiments illustrative of the peculiar properties of light, heat, and sound, with which Professor Pepper has been wont to entertain them. In short, as a first progressive book in natural philosophy, and as one eminently calculated to stimulate the reader to a deeper research into scientific truths, we know of none which commends itself so well as Professor Pepper's "Cyclopædic Science Simplified." It is, moreover, a handsomely gotup volume, and does credit to the publishers, who have made the outside of the work as attractive as the Professor has made the

OTES ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL APPLICATIONS. NOTES

NEW PROCESS FOR PRESERVING WOOD—ELECTRO CHEMICAL DEPOSITION OF IRON—METHOD OF ES-TIMATING THE AMOUNT OF WATER IN STARCH OR MEAL.

NEW process for preserving wood deserves A NEW process for process as a short notice, since it offers one or two advantages over the processes commonly adopted. These, as our readers will know, consist in impregnating the wood with either a metallic solution, as sulphate of copper or sulphate of iron, or with creosote of coal tar. This last gives a disagreeable odour to the wood, and the two former more or less change the colour. In either case, the process is not adapted for floorings or other woodwork that is left exposed. The new material suggested is borax. Wood to be preserved is immersed in a saturated solution of this salt, and heat is gradually applied until the solution reaches 212deg. Fah., and it is then left for ten or twelve hours, according to the nature of the wood and the size of the planks. The wood is then to be removed from the tank, and stacked for a time, and then it is again immersed in a weaker solution of borax for about half the

ormer time. It is then to be dried, and it will be ready for use. It is advisable to dry hard woods before immersion, and put them in the solution while the wood is still warm. With this process, it will be seen that no alteration of colour is produced, and another recommendation is that the wood will be rendered very much less combustible. The rapidity with which a fire now spreads from floor to floor, as illustrated last week in Pentonville shows the great desirability of adopting some means for at least delaying the progress of the flames. We have no doubt the use of borax, as here suggested, would effect this, without adding very much to the expense of the structure. If it is desired to make the wood impermeable to water, this can be done by dissolving some shellac in the solution of borax. It would give a brownish colour to the wood, but would not be otherwise objectionable, and flooring would be rendered non-absorbent,

at all events, to cold water.

Much attention is now being paid in France to
the electro-chemical deposition of iron, and all the difficulties in the way of obtaining electrotype copies of engraved plates in this metal seem to have been surmounted by M. Feuquieres. This gentleman, however, keeps his process secret, but M. Klein is more communicative. Every salt of iron has been tried in turn for the purpose, but hitherto without success. We mentioned, three or four years ago, that Böttger had obtained the best results with iron alum, as it is called, which is really a double sulphate of iron and ammonia. It is a solution of a similar kind that Klein employs. He has tried it in various forms; first, a simple solution of iron alum, then a mixed solution of the sulphates of iron and ammonia, and, lastly, he made a solution, which he finds to answer better than either of the preceding, by first precipitating sulphate of iron with carbonate of ammonia, and then dissolving the precipitate in sulphuric acid, taking care to have a perfectly neutral solution. For the positive electrode, a sheet of iron eight times the size of the copper negative is used—that its supposing the chief is to obtain a copy in iron of is supposing the object is to obtain a copy in iron of a copperplate engraving. It was found that a good deposit of iron was not to be obtained directly upon plumbagoed gutta-percha or other moulds. It was necessary to get first upon these a very thin layer of copper, upon which the iron was deposited freely without any cracks or flaws. The copper can be removed from the iron copy by scrubbing it with a brush and rotten stone. Electro-deposited iron is, of necessity, quite pure. It is of a dull grey colour, and has rather a higher density than the best soft iron. It is malleable, but after hammering for a time it becomes brittle It cements in charcoal, and after cementation will take a temper. It may be magnetized, of course, and it retains its magnetism in a most remarkable manner when common iron loses it. This suggests the use of needles made of electro-deposited iron for magnetic observation. The uses to which the art is applied are very numerous. Besides the reproduction of copper plates in iron, dies and stamps of all kinds are reproduced in the harder

metal with manifest advantages. Chemists are often required to determine the amount of water in starches and meals, and the application of heat is not always desirable. Herr Schoibler describes another mode of removing moisture, which is quite free from objection, and which gives a very ready way of estimating the amount removed. He shakes up, say, 100 grains of the starch or meal with 200 grains of absolute alcohol, or strong alcohol of known gravity, allows the mixture to stand for about an hour, then filters off the alcohol, and takes the specific gravity, which will, of course, show the amount of dilution the alcohol has undergone by the water present in the starch. The author gives a table for calculating the results, but any chemist can easily make the calculation for himself. It is hardly present to add that due attention, must be roid. necessary to add that due attention must be paid

to temperature.

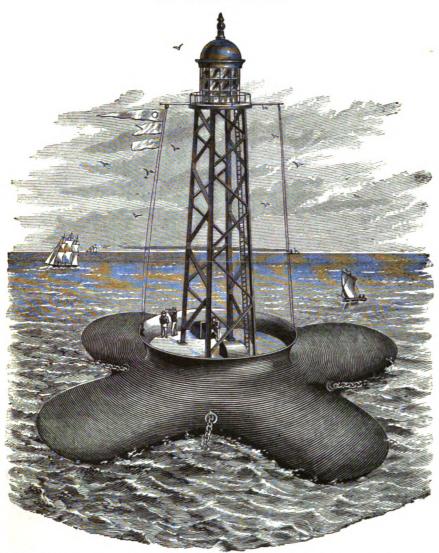
#### PARLIAMENTARY NOTES.

ON the evening of this day week, in the House of Commons, Mr. H. Palmer asked the President of the Board of Trade whether he had any objection to make a return of all railways on which there had been provided, in compliance with the Regulation of Railways Act, 1868, means of communication between the passengers and the servants of the company in charge of the trains, stating what is the nature and description of such



#### FLOATING LIGHT SHIP.

BY CAPTAIN MOODY.



respective means of communication, and what are the facilities for using the same in cases of emergency; and copy of any reports of the inspecting officers in relation thereto not already laid before the House.

Mr. Bright said it was expected that the various railways would have applied the means which were agreed upon to their rolling stock by the 1st of April, but representations had been made to the Board of Trade that that had not been done, and the time had accordingly been extended to the 1st of July. With regard to the reports asked for, he might state that a report had been pre-sented to the House by Colonel Yolland last year, and since that period nothing of importance had

and since that period nothing or importance had occurred worthy of being placed before the House.

At the same sitting, Mr. Gourley asked the First Lord of the Admiralty if he would state to the House his opinion of the ability and fitness, or otherwise, for active naval service, of the coast-guard and naval reserve seamen who composed the force recently really because the force recently really as the force recently really really as the force recently really the force recently under his command on board the Reserve Channel Squadron; if he would state in what evolutions the men and ships were exercised, and whether such as would arise out exercised, and whether such as would arise out of knowledge gained by experiments made and being made in modern warfare; and if he considered that the present ships of the Reserve Squadron would be of use for active service in the event of war, and, if so, what branch.

Mr. Childers.—In reply to my hon friend, I have to say that Admiral Key, who commanded the squadron of reserve, is about to send in a full report, with tables, of the conduct and fitness for service of the Naval Reserve and Coastguard

for service of the Naval Reserve and Coastguard men who embarked for the recent cruise. When the Admiralty have considered that report, it shall be laid upon the table with any other papers on the subject. It will also describe the evolutions and exercises of the squadron. I may, however, say in general terms that we have every reason to be satisfied with the men as a reserve, and

with their conduct. With reference to the last question, we are substituting for the old wooden dueston, we are substituting for the old wooden line-of-battle ships, which formerly were used as coastguard ships, ironclads of various types. There were three so substituted by my right hon friend opposite, and four more are now under orders to take the place of four wooden ships which went with the squadron. I hope that by the end of the year the whole of the coastguard fleet will be efficient armoured ships, and we shall thus have at our command within a few hours a squadron of nine ironclads to supplement the Channel squadron.

#### THE MOODY LIGHTSHIP.

WERE it possible to estimate the number of W vessels which are annually preserved from shipwreck through lighthouses and lightships, and the consequent number of lives spared, and value of the property saved from total loss, the aggregate sum would no doubt very much astonish even the members of the Statistical Society, clever though they be at figures. Lighthouses, however, cannot be built everywhere, and the members of the Trinity Board have admitted that the present form of lightship needs improvement. What we want is a lightship which can always carry her light, and can do for the ocean what the present gas lamps have done for our streets—enable us to see our way about, and not grope along, as in the days of the old oil lamps. The engraving which we this week present to our readers illustrates an invention which is a long stride in that direction. It is a lightship, novel in its construction, so nove

vessel from the star fish. There can be no doubt whatever that when we go to nature, and borrow our forms and designs from her works, we copy from the best models: so in this case. The four from the best models: so in this case. rays or bows which proceed from the body of the

rays or bows which proceed from the body of the ship present a floating area of immense size, and give the Moody lightship advantages it is impossible to gain from an ordinary one.

If our readers will refer to the engraving, they will perceive that there is a circular central hold, from which proceed at right angles four equal rays. The extreme ends of these rays are not fine, the theory of a ray program thin but round. The like the bows of an ordinary ship, but round. The rays are covered by sloping sides, extending to the centre of the vessel, which finishes off by an outward curved bulwark, 4ft. in height, so as to throw off the spray from the waves as they glide over the sides or run up the bows. The bottom of the lightship is flat, or nearly so, until near the edge, when it is gradually sloped to lessen the resistance when moving through the water. The slip is built in watertight compartments or bulkheads, eight being diagonal and running from the centre of the edge of each bow and the centre of each curve to join the ninth or circular bulkhead, which goes round the centre of the ship, connecting all the others. Over this central bulkhead is the upper others. Over this central bulkhead is the upper deck. The light can be carried on a tower or mast, or, as in the engraving, upon an open column — light but strong—made of angle iron. This -light but strong—made of angle 1ron. This column rises from the centre of the ship, the weight being placed over the centre of gravity. The engraving represents a lightship of the following proportions:—Length and breadth from ray to ray, 65ft.; height of light above the sea level, 60ft.; depth of hold, 12ft.; depth from water line to deck, 9ft. humarks 4ft 9ft.; bulwarks, 4ft.

There is ample room in the rays and in the centre of the ship for berths and for all other purposes. The lightship would be at all times comparatively dry, as her form would deflect the waves, so that instead of shipping heavy seas in rough weather, like an ordinary ship, the waves would be deflected and glide under and over her rays. Large scupper holes are placed round her hulwarks to carry off all waste water. It is probulwarks to carry off all waste water. It is proposed to fit her up with sails or small hydraulic engines, so that she could be readily moved from engines, so that she could be readily moved from place to place, or be under control and perfectly manageable should she from any cause break adrift, which is not very likely to happen. No difficulty would be experienced in steering her. This will be done by means of eight sluices, two at the end of each ray or bow, one on either side, but if procelled by soils those a steering approximabut if propelled by sails then a steering apparatus but it propelled by sails then a steering apparatus at the end of one of the rays. Her hawse pipes will be placed in the inner part of each curve, and in such a form that the cable can be always paid out in a line with the angle of the sides of the hull. The inventor proposes to moor her by means of three anchors in a triangular position. The advantages which this mode of mooring gives to the Moody lightship is very great indeed. The great defect in the present lightships that they roll heavily when in a cross see with is that they roll heavily when in a cross sea with a windward tide. This, of course, makes the light unsteady, and often necessitates its being lowered in a storm, when it is most needed. This, how-ever would never be the case with the Moody lightship, as her great flotation power and her four rays will prevent her rolling and pitching, and enable her to ride on the water like a gull.

The easiness with which the Moody lightship

would ride has a still greater advantage, and that is it reduces the liability of her breaking adrift. An ordinary ship in a heavy sea is very liable to snap her cable, not so much from the constant strain as from the jerking strain every time she rises after a plunge into the sea, but there would be no strain of this sort on the cables of the Moody lightship. In her case, the cables running from the central body of the ship, the four rays or bows are free to follow the motion of the waves. We understand the inventor has tested this by a small boat, 12ft. from ray to ray, which has been riding at Southend for fifteen months, and is there now. This boat has no deck covering, yet, although she outrode the winter, she never took the slightest harm nor shipped a pint of water. We have seen a report from the pier master at-Southend, who writes:—"It is with much pleasure I write to tell you how admirably your model rode this week present to our readers illustrates an invention which is a long stride in that direction. It is a lightship, novel in its construction, so nove that it is difficult clearly to describe it so as to dijustice to its inventor, Captain J. Moody, of St Maurice Villa, York. However, we will try. We understand the inventor is an old sailor, with more than fifty years of seafaring experience, and he seems to have derived the idea of the form of his during the gale was only a very small piece of bass (the same kind of rope that fishermen use). I will give her another trial the first southerly gale ve get, but am certain she will ride like a gull on

the roughest and highest seas."
We trust that we have satisfied our readers by the description we have given of this novel yet useful invention. There is no doubt that the introduction of this form of base for floating vessels will prove of great advantage. We think it is worthy of every attention, and hope the inventor will meet with the success he deserves.

#### CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

AT a meeting of this Society, held on the 2nd inst., a paper was read by Mr. Arthur C. Pain, on "The Principal Building Stones used in the Metropolis." The author confined the subject of his paper to the building stones proper, excluding paving stones and granites. It was illustrated with a map of England and Wales, showing the position and distance of the various quarries, and their means of communication with the metropolis by railway or sea. There was also a table giving the name of each, the county, name of owner, and agent in London; also the mineral and geological designation, component parts of stone, weight, chemical analysis, number of feet to the ton, average size of blocks, suitability for various purposes, the cost of working, colour, mode of working, price at quarre and the mode of working, price at quarry and at the various termini in London, as well as a few of the principal buildings in the metropolis and country constructed of each stone, with remarks on the beds, &c. The author then described chronologically as they came into use, the Kentish Rag, Gatton Fire Stone, Caen, Purbeck, Portland, Bath, Painswick, Bramley Fall, Mansfeld, Chil-Bath, Painswick, Bramley Fall, Mansfield, Chilmark, Ancaster, and Doulting. Specimens of each bed were exhibited from the quarries of Messrs. W. H. Bensted and Sons, of Maidstone; Mr. W. Carruthers, of Gatton; Mr. E. Foucard, of London and Caen; Mr. W. H. P. Weston and the Portland Stone Company, both of Portland; Messrs. Randell and Saunders, of Corsham; and Messrs. Pictor and Sons, of Box; Messrs. Husler and Co., of Headingley; Mr. Robert Lindley and Messrs. S. Fisher and Sons, both of Mansfield; the Wardour, Chilmark, and Tisbury Stone Company (Limited), of Tisbury and London; the Ancaster Stone Quarries Company, of Ancaster; and Mr. C. Trask, of Doulting; all of which have been used extensively in London. He also brought before the notice of the Society, and extinctions. hibited specimens of, the Hollington, Little Casterton, Clipsham, Forest of Dean, and Minera.

The decay of stone, its cause and prevention, having particular reference to London, was next considered. The decay, the author believed, was caused by bad selection. As a proof of this, he drew the attention of the meeting to the fact that nearly all the principal buildings in the immediate neighbourhood of each quarry were in an excellent state of preservation, while buildings in London of the same stone which had been comparatively recently built were more or less in a state of decay. He attributed this, firstly, to the fact that the masons who worked the stone for the local buildings understood the material, and knew which quarries and beds were good and rejected the bad, while the masons who worked the stone for the London buildings knew very often nothing about it, and put in good and bad without proper selection; secondly, the architect and en-gineer, in his multifarious duties, could not afford the time to study each different class of stone at the quarries, so that the specifications were very often loosely worded, of which advantage was constantly taken. He did not wish to throw blame on them, as there was no place where detail or reliable information could be obtained. The author then gave as a proof of the difficulty of obtaining information that he had devoted all his spare time for over six months in getting the results which he had laid before the society that evening, notwithstanding that the respective quarry owners and the officers of the Geological Museum and Mining Record Office had afforded

him every facility.

He then pointed out to the meeting how much this country was behind France in these matters, for M. Michelet, Chief Engineer of Roads and Bridges, had recently made a report by the direction of the French Government, on the building

subject were the Commissioners' Report, 1839, which treated generally and not in sufficient detail a few of the principal freestone quarries, leaving out hundreds of important quarries, notwithstand ing which, to prove how much a work of this kind is wanted, the report originally published at 6d. is now worth from 10s. to £1. The specimens of building stones at the Geological Museum was a step in the right direction, but the information concerning them was meagre in most cases, and on the quality of a stone if the specimen was a rough lump than if squared and faced up. The "Mineral Statistics," Part II., for 1858, published by the Mining Record Office, was a very valuable work, but it did not go deeply enough into the subject to be of great use for professional men. In conclusion, the author considered that until the heads of the professions of architecture and civil engineering, and the trades connected with the same, took the question up, and appointed an architect, engineer, chemist, geologist, builder, and practical stonemason, and an appointment of the same by the Government as royal commissioners, to report fully and collect specimens from all the principal quarries in the United Kingdom, to be put in the public museums in every large town, we should still see the stonework of our public and private structures decaying away from want of proper knowledge of the subject.

#### WHALE-CATCHING BY ELECTRICITY.

THE dangers and uncertainties to which those who are engaged in the whale fisheries are exposed render that occupation most perilous and hazardous. These dangers and uncertainties arise, firstly, from the distance at which the harpoon is necessarily thrown to strike the whale. Secondly from the unsteady motion of the boat at the time the harpoon is thrown, rendering it almost impos-sible to wound the whale in a vital part. Thirdly, from the whale, when struck, diving to the bottom of the sea, or swimming off at a great velocity and towing the boat with him, thereby frequently upsetting it, and endangering the lives of the crew. And lastly, from the whale, in his exertions to get free, breaking the line by which the harpoon is attached to the boat and escaping with it, thus rendering all the toil and labour of the crew of no avail. To obviate all this, Messrs. Bennett and Ward, of New Broad-street, City, have patented To obviate all this, Messrs. Bennett and ward, of New Broad-Street, Co., ...... a method of capturing whales by the agency of electricity, galvanism, or magnetic electricity. It consists in placing in the boat or in the whaling vessel a galvanic battery, with its coils and neces sary accompaniments, or any other electrical appa of any required intensity. Properly insulated wires are placed in connection with and pass from the opposite poles or terminals of the battery, and along the lines by which the harpoons are secured to the boat. The ends of these wires are continued to the points of the harpoons, so that points shall be in direct communication with the poles of the battery. When practicable, two harpoons are thrown into the whale at the same or nearly the same time, and when the battery is charged, the electric currents will pass along the wires to the points of the harpoons, and through the body of the whale, thus completing the electric circuit. Harpoons may be thrown simultaneously from other boats, by which means the same result will be attained. The whale (if the battery and its accompaniments are sufficiently powerful) will be paralyzed by the electric shocks, and will on or near the surface of the water without the on or near the surface of the water without the slightest motion, so that the boat can approach sufficiently near to spear and capture the fish without the possibility of the occurrence of the dangers to which we have referred.

When it is not possible to throw the two har poons at the same time into the body of the fish, it will, in some cases, be sufficient to have the extremity of one pole of the battery in the water as near to the whale as possible, while the harpoon attached to the other pole of the battery is injected into the body of the fish. Two harpoons may be bound together so as to form a single harpoon with two separate barbed points parallel to each other. the two component parts of which are insulated from each other, the wire from each pole of the battery passing down or through either part of this compound harpoon to the point, thus forming the electric circuit. Of course, in all cases where any instruments, such as harpoons, spears, &c., are likely to be brought into contact with the human

should enter into the body of the whale, as, if the poles of the battery are merely in communication with the skin of the whale, the same effect will be produced. In this way, electricity may be employed in the capture of seals and many other fish and sea or river animals.

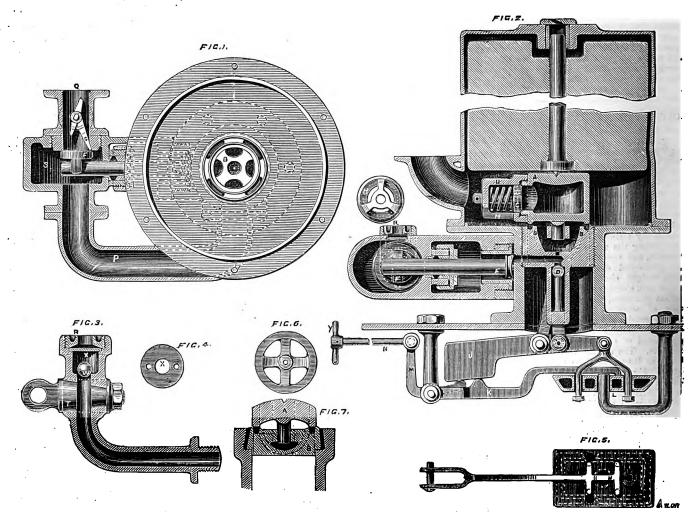
For salmon and river fishing generally, the inventors of the system propose that the insulated wires in communication with the battery shall pass through fishing rods (themselves properly insulated), the wires being continued in the form of a metallic thread properly insulated. When the salmon or other fish is hooked, another line may be thrown as near the first as possible, and the classific assessed to pass from the hook in electric current caused to pass from the hook in the fish's mouth to the other line. Or two persons may have their rods and lines in close proximity to one another during the time they are fishing, in which case no time will be lost in throwing the second line. Again, a double hook upon the same principle as the double harpoon may be employed, so that, the instant the bait is seized by the fish it will become paralyzed and unable to disgorge the bait. Another plan proposed is to have a galvanic battery placed on the bank of the river, one of its poles being placed in the water at one side, and the other conveyed across the river to the other side. It will be found that fish passing or remaining between the two terminals of the battery will be paralyzed and float at or near the top of the water, when they can be easily caught by a net or otherwise. Another proposal of the patentees is that wires from the battery shall pass partially around an ordinary net, so that fish passing into the net will be paralyzed and more easily captured. Such is the theory of fishing by electricity. The practice, however—as far as regards river fishing—will not, wethink, be followed by any true sportsman.

# THE ROYAL NATIONAL LIFEBOAT INSTITUTION.

TESTERDAY week a meeting of the above institution was held at its house, John-street, Adelphi. The minutes of the previous meeting having been read, £6 14s. was voted to pay the expenses of the Institution Lifeboat Civil Service, stationed at Wexford, Ireland, in going off in a north-east gale and heavy sea, and saving four men from the schooner "Hardy," of that port, which had parted from her anchors and gone ashore in South Bay, Wexford, on the 8th ult. Rewards were also ordered to be given to the crews of the lifeboats of the society stationed at Cahore, Wexford, Carnsore, and New Romney, for various services during the past month. The thanks of the institution, inscribed on vollum, and £1, were ordered to be presented to James Gale, coxswain of the Buckie lifeboat, £2 to F. Kerr, chief boatman of coastguard, for their sereices at that place in connexion with the lifeboat when she put off to the assistance of some fishing boats which were in distress in stormy weather off Buckie, and saved 45 lives. A reward of £2 was also granted to two men and a woman for going off and saving a woman and her son from a boat, which was overladen with sea-weed, and which sank off Whiddy Island, county Cork, on the 29th of March. The woman died from exhaustion soon after she was brought ashore. I'wo other persons had fallen overboard and perished before the arrival of the boat. Various other rewards were also granted for saving life from different wrecks. It was stated that Mr. and Mrs. Richard Thornton West had presented £700 to the institution to defray the entire cost of the lifeboat establishment to be formed on Port Isaac on the Cornish coast, and the first year's expenditure of the station. The Ancient Order of Foresters had also given the society £650 for the Foresters' No. 2 lifeboat establishment. Logacies to the amount of £500, £300, and £100, respectively, had been bequeathed to the society by the late Mr. James Sturm, of High Holborn; the late Mr. John Bewley, of Kingsland; and the late Miss Lucretia Tuckett, of Osnaburgh-street. friend to the Nottingham branch of the institution Various estimates, to the had given it £100. amount £468, for constructing lifeboat houses, and for other works at different lifeboat stations, were accepted. The whole fleet of lifeboats of the institution, now numbering upwards of 200 loats, was ordered to be painted, as usual, with the composition paint of Messrs. Peacock and Bu han, of Southampton. Payments amounting to £1,332 were made on various lifeboat establishments. A report was read from Captain D. Robertson, R.N., materials of that country, giving very detailed information, while the only works we had on the It is not absolutely necessary that the instruments visits to lifeboat stations on the Irish coast.

#### SAFETY VALVES. PATENT

BY MR. W. C. CHURCH.



Captain Robertson stated that he had everywhere found the boats in admirable order. Sir William Hall drew attention to the lamentable loss of life on recent occasions from some fishing boats of the coast of Scotland, which excited greatly the commissration of the meeting. The institution had built several safety fishing boats in Scotland, and some boats there on that model had been built.

CHURCH'S PATENT SAFETY VALVES.

WE last week described some improvements in W the slide valve by Mr. W. C. Church, of No. 2, Whitecross-place, Wilson-street, Finsbury, and No. 5, Church-street, Derby. We now proceed to notice that gentleman's improvements in safety valves and apparatus for preventing boiler explosions, as there promised. In our engraving, figs. 1 and 2 show a sectional plan and elevation of the improved safety valve, with the arrangements for preventing boiler explosions from either excessive pressure of steam, deficiency of water supply, or excessive water supply. The following is an arrangement for preventing an excessive pressure arrangement for preventing an excessive pressure of steam. A is an annular valve, with its seating B, of corresponding form; C is a valve, fitted at right angles to the valve A, for the purpose of regulating the pressure that is allowed to accumulate in the annular space or chamber of the valve A, and thereby governing the lifting power of the escaping steam upon the valve A. The steam issuing from the boiler is caused to pass circuitously both into the atmosphere and into the chamber of the valve, and the greater the pressure allowed to accumulate in this chamber, the greater will be the lifting and the greater the pressure allowed to accumulate in this chamber, the greater will be the lifting power of the escaping steam upon the valve A. By putting greater or less tension on the spiral spring of the valve C, this lifting power can be regulated to the greatest nicety, and thereby admit of a correspondingly accurate adjustment of the valve A, so as to blow off with steam at any given pressure. It is important that the area of the valve C should be equal to the area of the annular opening of the valve seating B. H is a cage for carrying the valve C. carrying the valve O.

Figs. 6 and 7 show a modification of this valve without the annular chamber, for obtaining the effect of accumulated pressure. In this case, the

effect of accumulated pressure. In this case, the increased discharging power of the valve is due to the escape upwards as well as outwards, as in the case above described, the outlet from the inner portion of the valve being at the top, as shown in fig. 7, and by dotted lines in fig. 6.

The arrangement for detecting a deficiency of water supply is shown in figs. 1 and 2. L is a float, which is worked by the rise and fall of the level of the water supplied to the boiler. Should the level of water fall from any cause beyond a given point, the weight of the float L will be caused to act on the lever J, and open the valve D, thereby allowing the steam to exort its full force upon the allowing the steam to exert its full force upon the large end of the ram E, and open the valve F, and thereby allow an amount of steam proportioned to the area of the outlet Q to blow directly on to the fire and extinguish it, if not at once attended to. The object of the throttle valve G is to enable the attendant to prevent the steam from putting out the fire, provided that he can at once supply the deficiency of water in the boiler. But before the attendant can turn the throttle valve G, he has to pass a key through the nut R, and break a glass interposed between the nut and the throttle valve, with the object of serving as a tell-tale against the attendant when broken. The glass cannot be replaced without detection, as the nut securing the glass into its place is screwed home by means of two holes, which are afterwards filled with lead,

two holes, which are afterwards filled with lead, and marked with a private stamp.

The valves F and D and the ram return to their normal positions in the following order:—When the water is again pumped to its former level, it raises the float L along with it, and takes its weight off the lever J, which at once closes the valve D, thereby removing the pressure from the large end of the ram E and allowing the contents. of the ram E, and allowing the constant pressure of the steam in the pipe P and the chest S to act upon the small end of the ram E and close the slide F, at the same time opening the throttle valve G.

Figs. 3 and 4 show a modification of the telltale for dispensing with the throttle valve G, and

which acts in the following manner: The cock i screwed into the side of the cylinder in which the large end of the ram E works, and when the steam from any cause acts upon the ram E the opening of the cock T by the attendant will instantly relieve from pressure the large end of the ram E, and allow the pressure exerted upon the small end to allow the pressure exerted upon the small end to return to its normal position. But by opening the cock T, the tell-tale glass X will be broken by the action of the steam projecting the ball W against it. This glass cannot be replaced without detection, as described.

The arrangement for detecting excess in the supply of water to the boiler is shown in figs. 12 and 15. When the float L is raised by an excess of water beyond its proper level, it will come in contact with the lever K, which will in turn raise the large end of the lever J and open the valve D, when execute the same action will take pleas with when exactly the same action will take place with the safety valve and tell-tale, as described with reference to the arrangement for providing against a deficiency of water supply. The bell orank a deficiency of water supply. The bell crank lever M is connected with the handle Y at the furnace end of the boiler by means of the connecting rod N. The use of this bell crank lever is to enable the attendant at any time to damp or put out his fire, by allowing the steam from the boiler to blow upon it. By drawing out the rod N the valve D is opened, and by pushing it in the valve is closed, without interfering with the tell-tale.

The inventor states that the patent valve will give 90 per cent more escape of steam than the mushroom valve in present use of same diameter, and will take 75 account to the patent when the patent was the patent with the patent was the patent with the patent was the patent was the patent was the patent with the patent was the patent was

and will take 75 per cent. less weight on lever to keep it to its seating.

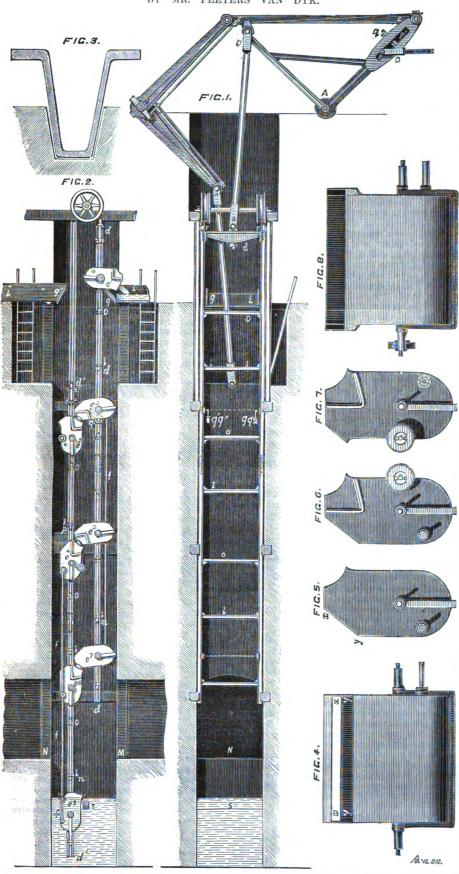
#### COMBINED MAN ENGINE AND WATER LIFT.

Eillustrate herewith a new apparatus for minwhile interest the new apparatus for min-ing purposes, which is the patented invention of Mr. Peeters Van Dyk, mining engineer of the Hague, Holland. The object here is to utilize the man engine ordinarily employed in lifting the miners as a means of lifting the water of the mine during the time the man engine is otherwise unem-

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### COMBINED MAN ENGINE AND WATER LIFT.

BY MR. PEETERS VAN DYK.



ployed. For this purpose, to each shaft of the lifts of the man engine is attached a series of tipping buckets, which, alternately with each stroke of the lifts, are emptied and filled into each other, thus with every stroke of the one lift, lifting all the water in the buckets one stage, and discharging their contents into the buckets of the other lift when at its lowest point of stroke, and with each stroke discharging one bucket of water at the day level or ground level of the mine. To suspend the

action of the tipping of the buckets, whilst the men are being lifted, the man engine is constructed with a variable stroke—that is, whatever stroke is used for lifting water a portion of it will be required for the action of tipping the buckets. When the men are to be lifted the stroke is reduced by that portion, the remainder being equal to the distance apart of the landing stages for the men. The specialities of this new apparatus are, firstly, that it forms a complete system of man engine;

which it resembles, by the form of its two shafts, furnished with landing stages and their alternate and rising and falling movement. Secondly, that the water is lifted and carried by buckets, which by appropriate mechanism, tip their contents one into the other at the end of the up stroke, so that the water to be lifted is always in the shaft of the lift which is ascending.

The advantages of this apparatus over lifting pumps are as follows:—It has neither valve, piston or stuffing box. The parts subject to wear are axles moving slowly in their journals and lightly loaded. The repairs are therefore less frequent than in force pumps for great elevation; there is nothing hidden of the mechanism, so that it may be easily inspected every day. This man engine having a very great stroke (about 13ft.), can be changed into a water lifter, and allows of one shaft being used for the men and for raising water. One motive power suffices for raising water. One motive power suffices for raising water and for lifting the men—an important consideration for the mines where the engine working the man engine is only employed several hours a day. The new apparatus is preferable to pumps for irrigating lands, by reason of the working not being liable to interruption by the earthy and solid matters which river waters carry in suspension in great quantities, especially in tropical and mountainous countries.

In this apparatus, two rods a a 1 (fig. 1 of our

For a complete apparatus, three forms of buckets are required. First, a pair of buckets,  $e^7$  and  $e^8$ , fig. 2, represented separately by the two enlarged figs. 4 and 5. The buckets fill by immersion, the water entering by the opening determined by the brim xy. Second a pair of buckets,  $e^1$  and  $e^2$ , fig. 2, specially intended to empty the water at the surface of the earth, represented upon a larger scale by the figs. 7 and 8. Thirdly, pairs of intermediate buckets  $e^3 e^4 e^5 e^6$ , of fig. 2, and more clearly indicated by figs. 6 and 8. The number of these buckets, of course, depends upon the height the water has to be lifted. Each bucket in emptying makes a little more than a quarter of a revolution (about 94deg.) The number of buckets to be placed upon each lift depends upon the depth of the mine and the outfall of the water on the capacity of the buckets, and the number of strokes the lifts make in a given time. In our example, the distance of the buckets is 10ft. 6in., and the stroke of the piston is 30in. more. All the buckets of the same lift, counting from the first or highest one, are united one to the other by the rods ff, so that the movement given to one bucket is imparted to all the others.

The quarter of a revolution that the buckets should have to empty their contents one into the other is given to them by the tappets g and g. The tappets g and g, fig. 2, are placed and fixe by the side of the receptacle for the water at the surface i; they act upon the buckets e. Placing them one after the other in the position indicated at e. The two other tappets g g and g g, fig. 1 (of which one of the two only is visible, though partly hidden by the bucket e3 in the projection, fig. 2), are fixed to the wooded traverses of the shaft. Their form is simply an inclined plane, the two first tappets forming an angle of 58deg., the two others of 28deg.

From the preceding description, the working of the apparatus will be easily understood. The right lift attached to the rod a is at the end of its np-stroke whilst the left lift is at its lowest point. The bucket e<sup>8</sup> is filled by immersion, the water filling it as indicated by the arrows near y, where filling it as indicated by the arrows near y, where the side of the back part of the bucket is opened for a sufficient depth. The bucket never fills higher than the stop y, which exactly determines the quantity of water to be lifted at each stroke. All the other buckets are made of such a capacity that, after receiving the contents of the buckets e<sup>7</sup> or e<sup>8</sup>, the level of the water shall be low enough to avoid any spilling. The level of water of a full bucket ought to be about 4in. below the spout, so bucket ought to be about 41h. below the spout, so that it shall not begin to tip its contents till it is inclined 18dog. By these means, and with a well chosen form of spout, all loss is avoided in tipping one bucket of water into the other. Whilst the bucket  $e^8$  is filling by immersion in the reservoir of the shaft, the buckets  $e^6$   $e^4$  and  $e^2$  have been filled in the same time by the buckets  $e^{7}e^{5}$  and  $e^{3}$ , whilst the highest one of all,  $e^{1}$ , has poured out its contents on the surface. At each simple stroke of the piston all the buckets of the shaft which is descending are empty, whilst those upon the as-cending shaft are full. Each single stroke of the piston, therefore, carries to the surface outlet the contents of one bucket. The normal position of the buckets is vertical, as the engraving shows, for the full buckets on the left lift.

In order that the buckets shall right themselves after they are discharged, and retain that position, when they are charged up to the time they strike the tappets, each bucket is fitted at its base with a brace jointed to the axles or prolonging them so as to pass under the buckets in the form of a bent axle to give them the necessary weight to keep them constantly vertical, as shown at figs. 4, 5, 6, 7, and 8. The connecting  $\operatorname{rods} ff$  contribute also by their weight to right the buckets when the rollers quit the tappets. The righted buckets ought to rest against a pin fixed in the lifts, so that all swinging may be avoided. The traverse S serves also to right the buckets in case the counterweight has not acted. On calculating the work spent to lift the water and so tip it at the end of each stroke into the opposite buckets, and including the force absorbed by the friction of the axles and the absorbed by the inicion of the axies and the displacement of the counterpoise, also taking into account the actual weight of water put out, and comparing the force expended with the useful effect obtained, it is found to give a useful effect of 82 per cent.

In our engravings, the motion is imparted by beams attached to some motor with a rotating axle. The alternate movement of the lifts can also be more simply produced by uniting each of the lifts direct to the two cylinders of a steam engine, the cylinders being placed vertically and axially with each of the corresponding lifts. It is in this way that the man engines of the Coal Company of "L'Esperance de la Société John Cockerill de Seraing," are worked.

When the apparatus is to be used as a man engine, the buckets are emptied by tipping, to do which the connecting rods of the buckets e and e are unhooked. After which the apparatus will empty itself in m—1 strokes, when n indicates the number of buckets on a lift; the stroke is then shortened from 13ft. to 10ft. 6in. In the mechanism indicated in our design, this reduction is obtained by taking out the wedges qq of the beam A, fig. 1 and moving them slowly, which displaces the sliding block p of the connecting rod, carrying it into the second position  $p^{-1}$ ; then putting in the wedges  $q \, q$ ; the block of the connecting rod is refixed, so as to give the lists a stroke of 10ft. 6in. With a stroke of 10ft. 6in., the traverses l, &c., of the two lifts will be opposite each other or at a level with the end of each stroke. In using these traverses  $l \ l$  as landing stages for the feet, and the parallel traverses  $o \ o$  shoulder the feet, and the parallel traverses o shoulder height for the grasp of the hand of the miner when he steps out of the lift going up or down as he desires, the apparatus will be identical with the man engines, that is to say, there is no essential difference with the ordinary kind. These landing stages l m and l n, corresponding to the level of the galleries M and N, as the landing stages l d with the galleries or floars for level and l. and l with the galleries or floors for leaving A and B. It is possible to establish upon the traverse l a landing stage in wood more commodious which will hold at least two men at once. The capacity of the buckets of the dimensions indicated is 70 gallons; the apparatus not containing any water when being used as a man engine can then be used in all safety with a load up to 7 cwt. per landing stage.

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

(Concluded from page 408.)

MR. R. C. JAY read a paper upon aeronautics. In describing an arrangement, which he believed entirely new, he said that his endeavour had been to design a machine, by means of which it might be possible to navigate the air by taking advantage of the various currents that might be found at different heights, and also to enable the aeronaut to ascend or descend at will. Machines sustained by hydrogen gas can never be driven against a strong wind, as, in order to obtain any great speed, there must be weight to overcome the resistar the air, and any machine lighter than an equal bulk of air would require a much more powerful engine to propel it with any degree of speed than it would be possible for it to carry, even supposing a ma-chine of that description could be made sufficiently strong. Weight, which is generally regarded as a great obstacle to the successful attainment of aerial navigation, is, in reality, an essential ele-ment of success, for without weight we could never expect to overcome the powerful element it is our aim to subdue. One circumstance, which appeared to be often overlooked, is, that a machine floating in the air is entirely separated from the earth, and that, with a given force, it will travel an equal distance through the air (not over the earth) in any direction in a given time, viz., the speed will increase until the resisting pressure of the air equals the motive force. Now, we will suppose the machine to be passing over the earth in a direction contrary to that of the wind, with a pressure of 2lb. to the square foot. If the wind suddenly increase in force the only way in which it will affect the machine will be by diminishing the speed at which it is passing over the earth but the pressure will remain the same, and there will be no more danger than there was before the will be no more danger than there was before the force of the wind increased. When a machine is regarded in this manner, as being entirely removed from the earth, it is evident that there is no more danger in a strong wind than there is in a calm, so long as the machine is under control, and sufficient for that purpose with buoyant apparatus is the power to ascend and descend at pleasure, together with a progressive speed of ten miles an hour. A machine constructed after the plan he produced would, he believed, fulfil these conditions, but he was afraid its utility would be very small and the apparatus expensive. What is required is a machine that would raise itself from the earth, and travel through the air at a speed of from two to five hundred miles per hour, and he felt convinced that it was quite possible to con-struct such a machine. The greatest difficulty seems to be the start from the earth, for when the machine is once fairly in motion, gravitation may be made to assist in obtaining the required speed In reference to propellers, he had come to the conclusion, from his own experiments, that screw fans are not of much service where there is any appreciable resistance to their progression, which must always be the case when it is necessary to ascend; and a slight restraint will cause more and more slip until the fan acts as a blower, and the machino falls back or remains nearly stationary. He was of opinion that we must regard wings as the most effective propellers even for mechanical birds, and he had no doubt that when the correct action has been discovered we shall find that they act on the air much more powerfully than the One great advantage of the wing is that it acts as a sustaining plane as well as a propeller; whereas the screw fan acts only as a propeller, and does not even sustain its own weight when used in a forward direction. He then described the plan before them. The principle on which the machine is constructed is such that when it is being driven forward the pressure of the air on the nose is nearly equal on all sides, and, with that end in view, the propellers are placed on the central line through the two sustaining gasholders. The gasholders are of silk or other suitable material, as in ordinary balloons, and are covered with netting affixed to the framework supporting the engine and car. At the bottom of the gasholders there should be some folds in the material with elastic bands to draw them tomaterial with elastic bands to draw them together, so as to keep the gas bags in shape and to allow for the expansion of the gas. The framework, composed of bamboos crossed, and strengthened by netting, may with advantage have the lower portion covered with silk or canvas, so as to form a keel which will give much greater stability to the machine, and keep its axis in the right direction. He then called the attention of

the meeting to the propellers, of novel construc-tion, which would have a considerable hold on the air. The manner in which they worked would be best understood by examining the small model he had brought with him. The propeller is very similar to a double-bladed paddle, with the blades placed at right angles; and that it has an oscillating motion at the same time that it revolves horizontally, bringing the forward blade into a perpendicular position at the commencement of stroke, and, at the same time, placing the other stroke, and, at the same time, placing the other blade in a horizontal position as it passes forward. The oscillating movement of the propeller may be obtained in a much more simple and effective manner than that shown in the model, by having a circular plate of metal round the shaft immediately below the oscillating shaft. Two slots must be cut in the plate to allow two pins, fixed in the oscillating shaft, to pass alternately over the plate as one to reverse the position of the blades the plate, so as to reverse the position of the blades of the propeller at the right moment. The propellers have also a slight shifting action at the same time that they drive the machine forward. same time that they drive the machine forward.
The motive power, as shown in the plan, is the compressed air contained in the two globular receivers, formed of alternate layers of vulcanized india-rubber and steel wire netting. These materials obtain the greatest strength combined with lightness. Each propaller (there have one one lightness. Each propeller (there being one on each side of the machine, as shown in the diagram of cross section) is furnished with a separate pair of cylinders, to enable the machine to be steered without the aid of a rudder. If one propeller be worked faster than the other, the machine will be driven out of its straight course, and may thus be carried in any direction with or across the wind. The whole machine, together with the occupants of the car, is supposed to be slightly lighter than an equal bulk of air, and it is made to ascend by moving the car backwards, so that the nose of the machine may incline upwards. The propellers will then drive forwards and upwards, and the air acting on the lower surface of the gasholders will cause the ascent to be more rapid. In descending, the car must be moved forward so as to incline the nose slightly downwards, when the effect will be the reverse of that obtained in the ascent, and the ma-chine will proceed to a lower level until the car is drawn back to the centre, when it will take a horizontal course at the will of the aeronaut. a strong wind is blowing, and a landing is con-templated, it would be well to look out for a hill or other shelter, which might break the force of the wind, and thus prevent the machine from being damaged.

Mr. Moy said he had sent a description of a plan very much like this to the MECHANICS' MAGAZINE

fourteen years ago.

Mr. Harrison asked the area of the two gasholders Mr. Jay said that would be regulated according

the weight to be carried.

Mr. Moy observed that he had made calculations, and found that there would be serious drawbacks to a machine of this kind. He found that, in order to work it, it must be 100ft. in diameter and 800ft. long. He had watched the motion of birds, and had come to the conclusion that the limit of speed is the thickness of wing.

Thanks were given to Mr. Jay for his paper.

The Chairman said it was theoretical to a great

The Chairman said it was theoretical to a great extent. There were a great many papers sent to him, but, fortunately, it was the duty of Mr. Brearey to answer puzzling questions. He would close with the remarks which he had made at the beginning of the meeting, viz., that the state of aerial navigation totally depended upon experiments that may be made, and which he hoped will be made, and, if judiciously and carefully carried out, will increase human knowledge.

It was announced that there would be another

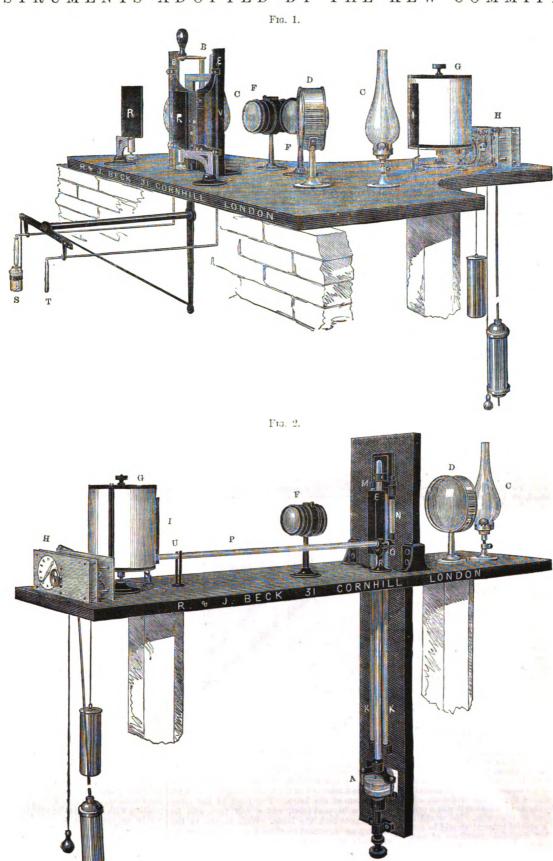
It was announced that there would be another meeting about the first week in July, provided that papers of sufficient interest would be forthcoming, and it was very desirable that members having anything in the way of models should exhbit them in the room in which they had that day met.

The thanks of the meeting were given to Captain Murray for his offer of £10, and a vote of thanks vas also given to the chairman.

The proceedings were then closed.



#### INSTRUMENTS ADOPTED B YTHE KEW COMMITTEE.



These were the thermograph and the barohill These were the thermograph and the barograph used by the Kew Committee, and which we now illustrate. The thermograph is shown at fig. 1. This instrument is designed to record the thermometric changes in the atmosphere by means of photography. The instrument, when in use, is encased in a mahogany box; all the light is excluded, save such as is admitted through an airspeck in each thermometer. The thermometer bulbs project about 1ft. from the wall upon which the edge of the slate rests. In our engraving, S is the edge of the slate rests. In our engraving, S is

the wet-bulb thermometer; T, the atmospheric thermometers to the required height; C C, the gaslights; D D, the condensers throwing the light on to the mirrors R R; and R R, the mirrors throwing the light through an air speck in the thermometers at V V. E E are the slits through which the light from the mirrors R R pass, F F are the photographic lenses throwing an image of the air speck in each of the thermometers on to the cylinder G, and G is the cylinder upon which the

this case, which fits on to the horizontal slate, is removed in the engraving to show the internal construction. A is the mercurial barometer; B, the screw for adjusting the barometer to the required height; C, the garlight; and D, the condenser, throwing the light over the top of the mercurial column, and through the slit E. E is the slit through which the light from the gaslight C passes; F, the photographic lens, throwing on to the cylinder G an image of that portion of the slit E through which the light is admitted after passing over the top of the mercurial column; G, the cylinder upon which the photographic paper is placed; and H, the clock which turns the cylinder G round once in forty-eight hours. I is the shutter which cuts off the light from the photographic paper four minutes every two hours, and so leaves a white time line when the photographic result is developed; K K are two zinc rods fastened to the vertical slate at L and sliding at M, connected with a glass rod N which rests on one end of a glass lever O, and indicates thermometric changes by means of expansion and contraction. P is a glass lever, moving on a fulcrum R, and sup-porting the end of the glass rod N at O, with a brass plate fixed on the other end U. This brass plate being attached to the glass rod P, which is in connexion with the zinc rods K K, rises and falls with every thermometric change, and by so doing exposes more or less of the lower portion of the photographic paper to the action of the light falling on it through the slit E, so that barometric changes due to temperature alone are indicated on a line on the chart, which, if such changes are considerable, becomes undulating instead of straight. The engravings are made to a scale of one-eighth full size.

#### THE LONDON ASSOCIATION OF FOREMEN ENGINEERS.

A CROWDED meeting of members and friends of this rapidly growing institution took place on Saturday last at the City Terminus Hotel. The of this rapidly growing institution took place on Saturday last at the City Terminus Hotel. The chair was filled by the president, Mr. J. Newton, of the Royal Mint, and the vice-chair by Mr. John Ives. As usual, the election of new associates, honorary and ordinary, preceded the immediate business of the sitting. Mr. Fergus Jordan, of Messrs. McGlashan's, Victoria Works, Drury-lane; Mr. Samuel Goddard, of Woolwich Arsenal; Mr. John Hoodaw, also of Woolwich Arsenal; and Mr. Welch, of Messrs. Ravenhill and Co.'s, constituted the list of new ordinary members, and Mr. N. H. Allan, of Messrs. Gwynne's, and Mr. W. M. Whieldon, of the firm of Whieldon, Lecky, and Lucas, were the honorary associates unanimously elected.

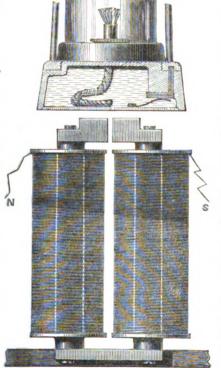
Mr. David Walker then proceeded to read a paper on the "Simplification of the Patent Laws." After defining what patent rights really mean, the author traced at considerable length and with great lucidity, the history of the patent system from the time of Queen Elizabeth to the present hour. He compated the views of Mr. Macfie, Sir Roundell Palmer, Lord Stanley and others who took part in a recent debate on the abolition of the patent laws in the House of Commons, and declared himself in favour of a sweeping amendment of the patent system, but quite opposed to abolition. Mr. Walker considered the principal evils of the present law of patents to consist in—(1) The exorbitant cost of a

system, out quite opposed to abolition. Mr. Walker considered the principal evils of the present law of patents to consist in—(1) The exorbitant cost of a patent; (2) the imperfect security it afforded to an inventor; (3) the litigation which its maintenance entailed; and (4) the cumbersome and vexations nature of the legal machinery for settling disputed questions affecting patent rights. The first demand the would make was that the original cost of a rehe would make was that the original cost of a pa-tent should be reduced to a sum not exceeding what tent should be reduced to a sum not exceeding what was absolutely necessary to cover legitimate expenses. In the next place, there should be appointed a competent body of skilled men, whose characters were above reproach, and who should be empowered to judge of the merits or defects of an invention, and decide as to whether it was a proper subject for a patent or otherwise. He would also recommend that a special tribunal should be established for deciding disputed questions of patent right. Common juries, as a rule, were quite inadequate to this task. Finally, he would ask that, as the rights of authors and inventors were absolutely analogous, so the laws relating to invention as the rights of authors and inventors were absolutely analogous, so the laws relating to invention should be assimilated as closely as possible to those of copyright. These points, the reader of the paper maintained, were of vital importance, and when they were gained the simplification of the British patent law would be an accomplished fact. The foregoing constitutes the barest possible summary of Mr. Walker's elaborate, and, it may be allowed, eloquent contribution, to the proceedings of the Foremen Engineers' Association on Saturday. It was followed by a very spirited discussion, shared in by Messrs. Humes, Thornburn, Irvine, Bragg, Muir, Shotton, Ives, Vinicombe, and others, the feeling expressed by all being favourable to the reformation rather than the destruction of the

patent system. In fact, it was manifest that the meeting was unanimously of this way of thinking. In putting the usual vote of thanks as a compliment to the author of the paper, Mr. Newton took occasion to say that he hoped another Royal Commission would ere long be nominated to examine into the whole would ere long be nominated to examine into the whole subject of patents at home and abroad. By comparing the various systems at work throughout Europe—and notably in the United States of America—with that in force in this country, data might be obtained which would be of service to the Legislature in amending our own admittedly defective patent laws. For himself, he was exceedingly glad that the question had been ventilated at a meeting such as theirs, because every member was a practical man, and most of them had had actual experience of the evils they deprecated. Certainly opinions thus formed were worthy of consideration, and they had been expressed in such a manner that ought to show us that the interests of all classes of the meshow us that the interests of all classes of the mechanical trades, and not one in particular, were recognized by the Associated Foremen Engineers. The vote was then passed by acclamation, and shortly afterwards the sitting closed.

#### LOCKING MINERS' LAMPS.

HEREWITH we illustrate the electro-magnetic lock for miners' safety lamps, which is the invention of Mr. S. P. Bidder, jun., Assoc. Inst. C.E., and which was exhibited by him at the president's conversazione. We show a portion of a miner's safety lamp in section, and the electromagnet, from which the method of operating will be seen. With this arrangement it is quite inpossible for the miner to tamper with or unlock With this arrangement it is quite imhis lamp. The lamp is self-locking. After it has been trimmed, the bottom is screwed on, and the pin, with the steel spring underneath, flies up into the upper rim; it thus prevents the bottom from



being again unscrewed until the electro-magnet is applied to the outside, and the steel armature which is immersed in the oil is brought down on the bottom of the lamp. The joint of the lamp may be a bayonet joint, and a half turn will be sufficient to lock the lamp. With regard to the locking arrangement in the oil cistern, it may be variously modified; a lever may be used with advantage, as then half the present battery power will be sufficient to work it, but the one shown in the engraving is the most simple, and is that preferred by Mr. Bidder. All the existing lamps can be altered at a small cost to work on this principle. The battery is an ordinary six-cell carbon battery, with plates 7in. by 6in. charged with sulphuric acid and water. The cost of maintenance of this would not exceed £1 5s. per annum. No ordinary magnet that could be carried about would be of sufficient

with No. 18 covered copper wire, and is arranged under a brass ring let into the lamp table. We may add that this lamp is patented by Mr. Bidder and Mr. Craig.

#### A NEW LIFE SAVING APPARATUS.

ON the evening of yesterday week some experiments were made in the river Thames, at Battersea, with a new and apparently perfect contrivance for saving life in case of shipwreck. has just been introduced into this country from America, and by it a man can live in comparative comfort in water for a considerable period. The apparatus, which is the invention of Captain Stone, of New York, consists of a cork belt, a waterproof india-rubber over-coat, a pair of propellers, and a can for provisions. The experiment was made by Mr. and Mrs. Craddock, the agents, who gave a practical explanation of the apparatus by together leaping from a barge into the river. The preleaping from a barge into the river. The pre-parations, which only occupied three minutes, were conducted in public. They first buckled cork belts round their waists, and over them they drew waterproof tunies, which covered the whole of the body, except the hands and face, around which it is fastened by elastic bands; having strapped 7lb. weights over the feet, so as to enable them to maintain their equilibrium, they were fully equipped. They took with them into the water a tin canister, in which is carried food, water, and other necessaries. This canister is most compact in its construction, in it being packed biscuits, meat, spirits, a lamp, matches, blue lights and rockets for signals, a revolver, and six quarts of water, which, being packed in a compartment at the bottom of the canister, serves to keep it in an upright position. Experiments have been tried on various parts of the Continent by Mr. and Mrs. Craddock, with marked success, and it is stated that the Prussian government have determined to adopt the apparatus. On Thursday week, Mr. and Mrs. Craddock remained in the water for a little over half an hour, and showed that they could travel with ease, although slowly, by means of travel with ease, although slowly, by means of their paddles, which are in the form of a duck's foot and fastened to the hands. The complete apparatus, it is said, will be supplied for £7, and arrangements will be made by which passengers between London and New York especially will be supplied with suits for the voyage by the payment of £1 in addition to their passage-money.

#### A NEW DEADLY WEAPON.

WE understand that a mitrailleur, or machine gun, of Belgian manufacture, will shortly arrive in this country for trial. Major G. V. Fosbery, V.C., Bengal Staff Corps, has been employed for some time on the Continent in inspecting and reporting on various specimens of this new description of arm. The Balgian witagillaur which is for some time on the Continent in inspecting and reporting on various specimens of this new description of arm. The Belgian mitraileur, which is considered the best of its class, is the invention of M. Montigny. According to the "Globe," this weapon consists of thirty-seven steel barrels, planed on the exterior to an hexagonal form, so as to fit together with ease. These barrels are then soldered in a wrought-iron tube, and fitted with a sliding breech piece, consisting of a block containing an arrangement of spiral springs for firing a central-fire cartridge in each barrel. The breech block is moved by a lever, and the turning of a handle is an arrangement of spiral springs for firing a centralfire cartridge in each barrel. The breech block is
moved by a lever, and the turning of a handle is
sufficient to fire the cartridges one by one, the
rapidity of fire being proportioned to the speed with
which the handle is made to revolve. The face of
the breech block is grooved to admit the cartridge
holder or extractor, the former being a steel plate
drilled with holes to correspond to the position of
the barrels and strikers. Several of these plates
accompany each gun, and it is asserted they can be
filled with cartridges and dropped into the proper
position with considerable ease and quickness. The
whole apparatus is mounted on a two-wheeled position with considerable ease and quickness. The whole apparatus is mounted on a two-wheeled carriage. Major Fosbery appears to have witnessed a number of experiments with this arm at the Tir National, Brussels, and at the Artillery Polygone, Brasschaet, and his report is on the whole favourable. Many missfires are recorded, due, it is said, to imperfect ammunition; but this would be unlikely to occur were Boxer cartridges employed. The experiments at Brasschaet were made at distances varying from about 430 to 1,100 yards, the target consisting of inch planks nailed to uprights, forming a screen of 97ft. in length by 9ft. in height at the two extremities, and 12ft. in height over a space of 26ft. in the centre. At 430 yards, 84 per cent. of the projectiles struck this screen; 370 cartridges were placed in the gun, which was worked by one man; of these, 40 were missfires, 278 struck, and 52 missed the target. The time was about three power to open this lamp. The lamps can be opened at the rate of 300 an hour, if required. The whole of the lamps at the Harecastle Collieries, in Staffordshire, will shortly be altered to this principle. The electro-magnet is wound round.



so difficult to obtain the correct elevation, in the absence of a properly graduated target scale, that the attempt to fire at this range was abandoned. It 370 shots per minute can be fired after some practice.

### Megal Intelligence.

VICE-CHANCELLOR'S COURT. June 8.

(Before Vice-Chancellor Sir W. M. James.)

AMORY v. BROWN.

THIS was a suit to restrain the defendant from using a patented invention relating to the ornamentation of muslins and other fabrics, of which the plaintiffs, Messrs. Amory and Eaton, trading under the title of John Heathcoat and Co., at Tiverton, are exclusive licensees. The invention consists in a new method of affixing to the surface of muslins or other fabrics drops of gum or other transparent viscous matters which, when dry, harden, and present the appearance of beads, which are either bright and transparent or coloured or opaque, as the case may be.

The defendant, who appeared in forma pauperis, besides alleging that the invention was not new, took the objection that the bill contained no averment of the novelty of the invention, or any other averment beyond a mere statement of the grant of

the letters patent.
Mr. Amphlett, Q.C., Mr. Theodore Aston, and Mr. Dundas Gardiner were for the plaintiffs; Mr. J. S. Tripp appeared for the defendant.

The Vice-Chancellor said that it was proved by

the evidence that the invention was entirely new and was one of public utility as well as elegance, and that the defendant had failed to establish any case against the patent. With respect to the objection that the bill contained no averment of novelty and utility, although it was usual, it was not absolutely necessary that the bill should contain such averments. The allegation of the grant and production of the letters patent threw upon the defendant the onus of disputing and disproving the novelty of the invention if he relied upon that defence. The decree would be for a perpetual injunction to restrain the defendant from using the invention without the licence of the plaintiffs.

The above patent was taken out in Mr. Brooman's name, and was described and illustrated in the "MECHANICS' MAGAZINE" at the time of completion.

TO CORRESPONDENTS.
THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 1s. 8d. yearly, or 10s. 10d. half-yearly payable in

advance.
All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher. Mr. R. Smiles, MECHANICS' MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursder avening.

ments should reach the office.
Thursday evening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good

cations unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M. Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise ments.

ments.

If Mr. C. Pemberton, R.N., whose method of rifling smooth-bore guns we described and illustrated in the MECHANICS MAGAZINE for the 14th May last, will send his address, we will forward him a letter which has been

ont to our care. BENNET'S PATENT STEAM COCK.—If the manufacturer f this cock will favour us with his address we will send

of this cock will favour us with his address we will send him a communication.

O. P. Q.—We recommend to your notice the "Millers, Millwrights, and Engineers' Guide," by Henry Pallett; the "American Miller and Millwrights Assistant," by H. C. Hughes; or the "Millwright and Millers' Guide," by Oliver Evans, with additions and corrections, by T. P. Jones. All are fillustrated, and are to be had from Messrs. Spon, 48, Charing-cross.

RECEIVED.—J. M.—H. F.—C. W. and Co.—F. W. B.—T. E. K.—L. Bros.—J. B.—R. F.—J. P.—P. H.—H. S. T.—R. N.—R. S.—R. I.—T. C.—R. T.—S. K. M.—R. S.—A. C.P.—I. T. C.—B. and Co.—R. T. B.—D. K.—O. P. Q.—E. D.—H. N.—B. P.—G. W. H.—E. J. L.—R. C.—J. H.—R. F. G.—C. J. F.—R. B.—C. H.—T. N. E.—J. P.—J. W.

#### Meetings for the Meek.

MON .- Royal Institution .- General Monthly Meeting, at

7al Institution.—General actual, according 2 p.m.
yal United Service Institution.—Rear-Admiral Sir John C. D. Hay, Bert, M.P., C.B., on "The Launch of H.M.'s Ship 'Northumberland,' "instead of the paper by Lieut. Philip Nolan, R.A., on "Finding the Range"; and Lieut.-Colonel Baillie, Bengal Staff Corps, on "The Application of Photography to Military Reconnaisance," at 8.30 p.m.

### Anbal, Military, and Gunnery Items.

THE screw steam ship "Spartan," launched a Deptford and completed at Woolwich, has had three trial trips, each of which, we understand, has proved unsatisfactory.

THE Wimbledon Prize Meeting will begin on July 5. The camp will be ready for occupation on the 3rd. Entries for the Queen's prize and the St. George's Vase closed on the 5th inst., and for all other prizes will close on the 10th.

THE large new turret ship built by Messrs. Palmer and Co., Jarrow-on-the-Tyne, for the Admiralty, made a trial trip off the Northumberland coast on Saturday, and her performance was deemed satisfactory. She left for Woolwich on Tuesday, and thence she will be despatched to Melbourne, Australia, where she will be kept for the defence of the

THE following cut from an American paper contains a nut for our long range friends to crack:—
"That's a good gun of yours, stranger, but Uncle Dave here has one that beats it." "Ah! how far will it kill a hawk with No. 6 shot?" "I don't use shot or ball cither," answered Uncle Dave himself.
"Then, what do you use, Uncle Dave?" "I shoot salt altogether. I kill my game so far with my gun that the game would spile before I could get it."

THE Hull Western Dock will be inaugurated on the 28th inst. The area of the dock is 23a. 0r. 1p., and it increases the aggregate dock area of Hull to and it increases the aggregate dock area of Hull to 84a. 0r. 16p. A banquet will be given on the occasion by the Dock Company, at Kingston-on-Hull, in one of the dock warehouses. The King's Lynn Dock Company will inaugurate its dock on July 7. The Prince and Princess of Wales will visit Lynn on the occasion, and the Prince will sustain a prominent part in the ceremony of inauguration, which will be followed by a banquet to the Royal visitors, the Lord-Lieutenant of Norfolk, and a large and distinguished party. and distinguished party.

THE Bermuda Dock, constructed by Messrs. Campbell, Johnston, and Co., will leave England on Camposii, Jonston, and Co., will leave England or about the 20th inst, convoyed by a squadron of our most powerful men-of-war. She will be towed down channel by the "Terrible," probably assisted by some smaller steam vessels. She will then be taken in charge by the "Black Prince" and "Warrior," which will see her into the latitude of Madeira, rior," which will see her into the latitude of Maderia, where, at a pre-arranged lendezvous, these ships will be relieved by the "Agincourt" and "Northumberland," which will take her within a reasonable distance from her destination, where the "Hercules" will complete the gigantic operation, by tugging her into port.

MAJOR-GEN. EDGAR GIBSON, a Peninsular and MAJOR-GEN. EDGAR GIBSON, a Peninsular and Waterloo officer, died on Tuesday week, in his 80th year. He entered the army towards the close of 1812, and was placed on half-pay in December 1839. The deceased General served in the Peninsula with the 1st Light Infantry Battalion of the King's German Legion from August, 1813, to the end of that war, in 1814, and was present at the siego of San Sebastian, an action in the Pyrenees, at the passage of the Bidasoa (where he was wounded), and in the subsequent actions in which the left wing of the army was engaged. He served also in the campaign of 1815, and was present at the battle of Waterloo. hattle of Waterloo.

ADMIRAL SIR GEORGE R. LAMBERT, G.C.B., died suddenly last Saturday evening. The deceased admiral, who was on the reserve list of flag officers, entered the navy in April, 1809, and while serving in the "Eagle" was engaged in the Walcheren expedition. He co-operated in the defence of Cadiz in 1810, and served on shore at the capture of Trieste, in 1810, and served on shore at the capture of Trieste, Fiume, and other places in the Adriatic, in 1813. He became licutenant in 1815, commander in 1822, and was posted in 1825. He served as commodore of the second class on the West India station, from January, 1847, to January, 1848. Held the same rank on the East India Station between September, 1850, and August, 1852, and subsequently as commodore of the first class, and as commander in chief.

of the first class, and as commander in chief.

A VARIED series of experiments was made last Friday at Shoeburyness. The first series upon an iron and asphalte concrete backing for iron shields, proposed by Colonel Inglis, the results obtained not being adequate to an accurate determination of its value. A new Firth's steel shell, of the same external form as the service 9-inch Palliser chilled shell, but carrying a very much larger bursting charge, and hardened only in the head, for penetration of armour, the body of the shell being of more tenacious metal, so as to permit of its passing unbroken completely through the target before bursting. The hit took place near the joint of the armour broken completely through the target before bursting. The hit took place near the joint of the armour face-plates; but the result, so far as can be stated under this circumstance, appeared to be highly satisfactory. The effect of the burst was exceedingly severe; it took place, as designed, completely in the rear. The large armour plate, 12ft. by 8ft., designed to cover entire the face of an iron shield—the rolling of which at Sir J. Brown and Co.'s works

at Sheffield we recorded some months ago—was fired at with the 7-inch rifled gun for proof. The plate was perforated with a 9lb. charge; the passage of the projectile, according to this ordinary test for 5-inch thick plates, should have been restrained by the plate. The shothole was perfectly round, and there was no starring or cracks of any kind.

### Miscellanea.

THE Liverpool town council have resolved to in vite the members of the British Association to hold their next annual meeting in Liverpool.

WE understand that the first velocipede prize at the Horse Show was awarded to Messrs. Brown and Green for their express velocipede, fitted with their patent instanter break.

MR. ALGER, of Windsor, an angler of much local MR. ALGER, of Windsor, an angles of mach recelebrity, has caught a trout weighing 1041b. at the Windsor weir. This is the finest trout that has been caught in that part of the Thames for many years.

THE conversazione of the Society of Arts, originally fixed for the 23rd inst., is unavoidably postponed to a later date, which will be announced as soon as the arrangements are completed.

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending June 5, was 3,970. Total number since the opening of the Museum, free daily (May 12, 1858), 1,582,736.

It is said that the Attorney-General of the United States has given as his opinion that the cable of the French Telegraphic Company cannot be connected with the territory of the United States without the permission of Congress.

PROFESSOR BLASER, of Berlin, has been commissioned to execute a colossal bust of Alexander von Humboldt for a committee in New York. The model is now finished and has been sent to Hanover, where it will be east in bronze under the superintendence of Howaldt.

The Rev. Alexander Dyce has bequeathed to the South Kensington Museum his important dramatic library, with its unique editions of Shakespeare, and all his pictures, miniatures, antique rings, and other works of art, upon the condition that a suitable room is built to receive them.

THE Prince of Teck, the new president of the Royal Botanic Society, has issued cards of invitation to a reception and special fete at the gardens, Regent's Park, on Wednesday, June 16, at 40 clock. Should the weather be fine it is expected to be one of the best-attended meetings of the season.

THE Palestine Exploration Fund are about to open an unique exhibition at the Dudley Gallery of pottery, glass and other specimens of ancient Jewish art, found by Lieutenant Warren in the course of his excavations. There has never yet been any exhibition anywhere similar to this one.

The number of Cornish pumping-engines reported for April is 18. They have consumed 1.411 tons of coal, and lifted 10-8 million tons of water 10 fms. high. The average duty of the whole is, therefore, 51.500,0001b. lifted 1ft. high, by the consumption of 112lb. of coal.

At the general monthly meeting of the Royal Institution of Great Britain, held Monday, June 4, Mr. W. R. Grove in the chair, Mr. James Spencer Bell, the Honourable Henry M. Best, and Mr. Henry Davis Pochin, were elected members of the Royal Institution. Mr. J. B. Marsden was admitted a member of the Royal Institution.

MAJOR W. J. WILLIAMSON, in one of his reports to the Commissioner of Cooch Behar, mentions that when a Garrow father is killed by a tiger—apparently a not uncommon mode in those parts of shuffling off the mortal coil—the sous change their names, in order to throw the tiger off the scent of their identity, in case he should have a rooted names, in order to thr their identity, in case hostility to the family.

THE "Neue Freie Presse" states that the great Austrian capitalists and contractors are now directing their energies towards the development of various projects in Turkey, and adds that, in view of the great expansion of commerce which the Suez Canal and the Turkish railways will create in the empire, it is proposed, among other works of magni-tude, to make spacious harbours for the chief seaports, such as Constantinople—which is totally without accommodation of the kind—Salonica, &c.

In the Art Schools National Competition, the In the Art Schools National Competition, the following gentlemen have acted as the examiners of the works sent up in competition from the schools of art throughout the United Kingdom:—Sir Francis Grant, P.R.A.; Sir M. Digby Wyatt; Messrs. J. C. Horsley, R.A., F. Pickersgill, R.A., R. Westmacott, R.A., and E. J. Poynter A.R.A., assisted by Mr. Redgrave R.A., and Mr. Bowler. Upwards of 64,000 works have been examined in this competition. this competition.



THE green colour of leaves, one element of which must be a vegetable blue, has led an American experimentalist to the conclusion that leaves turn red at the end of the season through the action of an acid and that the green solute pould be restored by red at the end of the season through the action of an acid, and that the green colour could be restored by the action of an alkali. The conclusion has been verified by experiment,—autumnal leaves placed under a receiver with vapour of ammonia in nearly every instance lost the red colour and renewed their

For some years the western tower of Ely cathedral FOR some years the western tower of Ely cathedral has been considered unsafe. Recently some internal scaffolding to the south-west turret of the tower has been fixed, by order of the present Dean, Dr. Goodwin, who has consulted Mr. G. G. Scott as to the firmness of the walls. Oak beams and iron bracing are to be fixed to prevent the bulging of the walls, and, in fact, to prevent the fall of any part of the upper portions of the tower.

THE number of visitors to the South Kensington THE number of visitors to the South Kensington Museum during the week ending June 5, 1869, was—on Monday, Tuesday, Wednesday and Saturday (free), from 10 a.m. to 10 p.m., 15,550; Meyrick and other galleries, 2,620; on Thursday and Friday (admission 6d.), from 10 a.m. till 6 p.m., 1,478; Meyrick and other galleries, 176; total, 19,824. Average of corresponding week in former years, 11,363. Total from opening of Museum, 8,503,252.

19,824. Average of corresponding week in former years, 11,363. Total from opening of Museum, 8,503,252.

We annex a return of the quantity of coal exported from Grimsby, May, 1869:—To Russia, 3,630 tons; to France, 3,572 tons; to Egypt, 2,253 tons; to Sweden, 2,140 tons; to the Hanseatic Towns, 1,265 tons; to Norway, 1,252 tons; to Denmark, 1,193 tons; to Prussia, 1,084 tons; to Belgium, 1,006 tons; to Italy, 849 tons; to Holland, 678 tons; to British North America, 396 tons. Foreign, 19,318 tons; coastwise, 3,441 tons; total, 22,759 tons. Corresponding period, 1868, Foreign, 24,097 tons; coastwise, 3,545 tons; total, 27,642 tons—decrease, 4,883 tons.

Herring fishing, which is a comparatively new maritime industry—that is, upon anything like an extended scale, in connexion with the Tyne—has commenced very satisfactorily, Over 100 large boats were engaged in this fishing last week, the most of them Scotch, and they were very successful. There were large sales every morning at North There were large sales every morning at North Shields, and the fish would average about 6s. per 100. In another week it if anticipated nearly 200 boats will be engaged from the Tyne in this fishing.

THE arrangements for the opening of the Suez Canal in October are fully developed. The Viceroy Canal in October are fully developed. The Viceroy of Egypt proposes to entertain his guests with unprecedented magnificence. On the banks of the canal are to be erected lodges, constructed, fitted, and decorated so as to be reproductive of the characteristics of the several countries to which the guests belong. Public amusements, theatres, circuses, balls, and fetes are to be provided for the recreation of the assemblage, which promises to be as brilliant as varied in its character.

as varied in its character.

THE Merchant Taylors' Company have paid £90,000 out of their corporate funds to the Gorenors of the Charter-house, for 5½ acres of the land lately occupied by the Charter-house schools, and intend to remove their school (which is not endowed) from Suffolk-lane to that locality. They have let a portion for building purposes, but they retain 3½ acres for the school and its playground. The Metropolitan Board of Works have purchased a slip of the ground in Wilderness-row for the purpose of widening the thoroughfare, intending at some future time to continue a carriage road through to St. John-street. to St. John-street.

Dr. STARK reports that one of the most important Dr. Stark reports that one of the most important elements bearing on vital statistics is night temperature. It is the night temperature, far more than that of the day, which has the most deleterious influence on human life. He recommends that, along with the statistics of mortality, both the absolute and the mean lowest or night temperatures should be published. Experience in Scotland has shown that an excessively cold night, when the temperature falls to 10deg. or to 5deg., or below zero, the change is most fatal to the aged, to the very young, and to those weakened by disease. In some of the smaller parishes of Scotland, a cold night has been known to kill all of Scotland, a cold night has been known to kill all persons above eighty years of age; husband and wife, brother and sister, being found dead in their beds in the morning after such a night of cold.

AT a meeting of the committee of works of the lersey Docks and Harbour Board, held last Friday, Mersey Docks and Harbour Board, held last Friday, Messrs. Low and Thomas, the projectors of the proposed Liverpool and Birkenhead Railway, were present by invitation. The principal features of this scheme discussed by the board were the two piers proposed to be placed in the river, and the height of the bridge above high-water mark. One member of the committee considered that the height of 140ft. above high-water mark was insufficient, and others were of opinion that objections would be raised to the piers in the river, but this was simply their expression as individuals. Messrs Low and Thomas were referred to the consorvators of the river, and if it was referred to the consorvators of the river, and if it was found that no objection was raised by them, the committee of works thought that the Mersey Docks and Harbour Board would not raise any difficulty.

# Patents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronologic al order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these sbridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

BOILERS AND FURNACES—3592, 3593
BUILDINGS AND BUILDING MATERIALS—3592, 3607
CHEMISTRY AND PHOTOGRAPHY—3561
CULTIVATION OF THE SOIL, including agricultural implements and machines.—3544, 3562, 3566, 3572, 3610, 3615
ELECTRICAL APPARATUS—3556
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper. &c.—3542, 3548, 3553, 3560, 3579, 3585, 3602, 3611, 3617, 3618, 3620
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—3557
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments. &c.—3540, 3347, 3519, 3558, 3663, 3564, 3571, 3578, 3590, 3595, 3597, 3598, 3604, 3606, 3614
GENERAL MACHINERY—3549, 3545, 3551, 3555, 3567, 3574, 3580, 3594, 3599
LIGHTING, HEATING, AND VENTILATING—3541, 3581, 3612
METALS, including apparatus for their manufacture—

METALS, including apparatus for their manufacture-3565 MISCELLANBOUS—8559, 3570,3571, 3573, 3575, 3576.

AINCELLANGOUS—3559, 3570.3571, 3573, 3573, 3576, 3583, 3584, 3586, 3587, 3589, 3591, 3596, 3602, 3613, 3616, 3619, 3618, 3618, 3619,

STEAM ENGINES-3546, 3550, 3568, 3600 WARFARE-3601, 3608

3540 C. Smith and J. Macfarlane, Glasgow. Washing machines. Dated November 21, 1863.

This consists in fixing ribs or feathers on the ends of the box, placed at an angle inclining upwards from each side of the box, so as to form inclined planes, meeting each other in the centre of the end. The box is moved backwards and forwards by a lever, which is attached to links centred on the ends of the box, at equal distances from the centre, and during this operation the clothes are thrown from side to side of the box overthe inclined planes hereinbefore described, and the increased agitation caused thereby effect a great saving of time and labour in the washing of clothes or other articles. In place of giving a backward and forward motion to the box containing the clothes, by means of a lever, a wheel and crank may be used.—Patent absenced.

3541 C. E. BROOMAN. Fleet-street. Manufacture of gas.

abandoned.

3541 C. E. Brooman, Fleet-street. Manufacture of gas.
Dated November 21, 1868.

The apparatus is combined with a motor which obtains its power from a portion of the gas produced, and which directly feeds the carburator or hydrocarbon reservoir with the atmospheric air necessary for generating gaseous varour.—Patent completed. vapour.—Patent completed.

with the atmospheric air necessary for generating gaseous vapour.—Patent completed.

3542 J. Sims, Liverpool-road. Ornamentingwoven fabrics. Dated November 21, 1868.

The ornaments which it is proposed to apply will take either the form of trimmings or continuous patterns or of isolated patterns or devices, and it is proposed to form them of woven fabrics of various colours and characters, as taste and circumstances may dictate, and to use in their fabrication either one such fabric or two or more of such fabrics combined. The inventor takes any desired length of these ornamental fabrics, and coats the same at the back with an adhesive substance, which will become sticky by the application of heat but will have no tendency to run and discolour the substance to which it is applied, and, when dry, will serve as an elastic cement when the trimmings or patterns are in place. The manner of coating the back of the fabric is as follows:—Upon the back of the fabric is as follows:—Upon the back of the extended silk or velvet he lays a thin sheet or film of gutta-percha, and by the application of damp heat and a moderate pressure he causes it to adhere and form a cement backing to the woven fabric. The gutta-percha thus applied will have no tendency to penetrate to the face of the woven fabric, and so injure its appearence, which would infallibly be the result if an adhesive solution were used. From compound fabrics thus produced, he proceeds to form the trimming or design.—Patent completed.

3543 J. B. HARRIS, Edinburgh. Driving bands. Dated

3543 J. B. HARRIS, Edinburgh. Driving bands. Dated November 21, 1868.

This relates to a novel mode of manufacturing driving bands, which ensures both strength and durability, at a comparatively small cost. The inventor first forms a core, composed of woven wire, embedded in a sheet of soft vulcanized india-rubber or gutta-percha or compounds of those materials. He employs one or more layers of this embedded woven wire, according to the strength of band required to form the core, and of a length and breadth determined by the size of band required to be made.—Patent abandoned.

Patent abandoned.

3544 C. J. FOSTER, Maldon. Agricultural machine:
Dated November 21, 1868.

The inventor forms around the inner periphery or rim of the motor wheel a continuous series of zig-zag slots, grooves, or projections, or they may be semicircular or curvilinear. The traversed motion desired to be produced, such as, for example, in a reaper or mower, is effected by means of a pin, projection, stud, or lever, attached to the longitudinal knife bar, entering the continuous groove, or bearing on the projections or ridges, when it follows that the revolution of the motor wheel will draw the bar to and fro, thus accomplishing the requisite reciprocating action for the cutters. The arrangements for obtaining the adhesion of the wheels is effected by means of a starred or long toothed point wheel, the teeth of which pass through the rim of the road wheel, apertures being cut in the rim of the road wheel, apertures being cut in the rim free from the slots, grooves, or projections. This

starred wheel has its bearings in a slotted guide, in connection with the axis of the motor wheel, and strengthened by the frame to which it is attached.—Patent

3545 T. W. WEBB, Bolton. Steam hammers. Dated November 23, 1868

vember 23, 1868.

The standards are now proposed to be made of Bessemer metal or cast steel, and, in order to prevent the injury caused by the sudden construction of the molten metal, the cross ribs, at each end of the moulding box, are made loose and capable of yielding when the metal is constructing. The steam cylinder is made of a plain shell of cast steel, or other metal, either cast, forged, or rolled, the ends of which fit in the crosspiece connecting the two standards, and in the cylinder cover, both of which are made of Bessemer metal or cast steel.—Patent completed.

3546 W. Inglis, Manchester. Steam engines. Dated

November 23, 1868.

The first part of the invention relates to the adaptation of separate cylindrical slide valves for steam and exhaust to the compound or high and low pressure system of steam engines. The second part of the invention relates to improved appliances for closing the steam valves of engines, or for closing any steam valves having the cut off effected or controlled by means of liberating gear.—Patent completed.

Patent completed.

3547 J. MANGNALL, Glasgow. Chairs, &c. Dated November 23, 1868

In the improved chair the oscillating part is restricted to the seat and back, with the arms, if any, which rest on a frame comprising the legs, constructed like those of any ordinary non-rocking chair. The top sides of the leg frame and the under sides of the seat frame are curved so that the latter will oscillate or rock on the former, or one may be straight and the other curved. The parts are connected by diagonal links made in any convenient way, to admit of the slight variation in their length, which the oscillating motion necessitates.—Patent abandoned.

2548 J. Rowney, M. N. and R. R. MUSS. Manchester.

oscillating motion necessitates.—Patent abandoned.

3548 J. BOWDEN, M. N. and B. R. MILLS, Manchester Carding engines. Dated November 23, 1868.

The inventors propose to introduce a roller, covered with card teeth, between the main cylinder and the doffer cylinder, to prevent the accumulation of fibres between the doffer and main cylinder, and thus to prevent the clouding or uneven thickness in the web, which is the chief cause of the web dropping or breaking between the doffer cylinder and the delivery rollers or calender rollers. They also propose to apply certain mechanical arrangements for stopping the feed rollers and doffer when the web breaks between the doffer cylinder and the draft rollers or calenders.—Patent abandoned.

calenders.—Patent abandoned.

3549 W. LA JENOTIERE, Bartholomew-road. Locks. Dated November 23, 1868.

The object of this invention is the production of a lock, which, when locked from one side, cannot possibly be opened from the opposite side, either by a similar key or any kind of pick lock. The essential characteristic of the improved lock is the use of a double bolt, one bolt sliding on or over the other, both moving in the same direction when set in motion, but each actuated by the key and slot, independently of the other from opposite sides of the lock, and each carrying a metal plate, termed by the patentee a shield, which lies close against the inner face of each lock plate, and is brought over or removed from the key hole, accordingly as the bolt carrying it is shot forward or thrown back. The key used for a lock of this improved construction is so made as to act only on the bolt upon the opposite side of the ward or guide-plate, to that by which it has been inserted, and the stem of the key does not extend beyond the end bit, so that it cannot enter the opposite key hole.—Patent completed.

3550 J. Hudson, Stockport. Steam engines. Dated No-

3550 J. HUDSON, Stockport. Steam engines. Dated No-

vember 23, 1869.

The inventor employs a square vessel having at two sides a number of ledges, and one open side, which can be closed by a plate bolted to it, and at the top an opening for the injection water, and at the bottom a nozzle connected by a pipe to the air pump. The ledges support dishes, having holes in the centre through which is passed a pipe, extending from above the vessel where it is connected to the ordinary eduction pipe.—Patent abandoned.

nected to the ordinary eduction pipe.—Patent abandoned.
3551 E. S. Hughes, Chancery-lane. Presses. (A communication). Dated November 23, 1868.

This consists in an annular wedge or annular wedges driven by power applied thereto either directly or by means of suitable gearing. This simple or compound annular wedge is the instrument by or through which the power is applied to the dies of the machine. In the application of the said annular wedge to various forms of machinery, various forms and combinations of the wedges and various subordinate devices are employed.—Patent completed.

and various supordinate devices are employed.—randa completed.

3552 J. HOULISON, Scarborough. Steeping berths. Dated November 23, 1868.

This consists in supplying sleeping accommodation or berths in railway passenger carriages, formed by fitting and arranging one, two, three, or other number of sliding or folding horizontal boards or frames of any desired width, by preference stuffed on their upper sides, and placed over the usual seats at any suitable desired heights or distances apart found most useful.—Patent completed.

3553 C. Crabtrer and J. Stell, Bingley. Paper tubes. Dated November 23, 1868.

The paper of which the tubes are to be formed is in a continuous length, and in width adapted to the length of the tubes to be produced coiled or wound upon a reel or pulley, from which it is conducted by guide pulleys to the surface of the pasting drum, which is supported by its axis, and revolves in a trough containing paste of the consistency desired. Brushes may be used, if desired, to aid the laying of the paste from a separate trough to the surface of the paper. The surplus paste is removed from the surface of the paper. The surplus paste is removed from the surface of the paper. The surplus paste is removed from the surface of the paper. The surplus paste is removed from the surface of the paper. The surplus paste is removed from the surface of the paper. The surplus paste is removed from the surface of the paper.



rollers to slide in slots or grooves formed for them, and applied to the under side or other suitable part of the carriage, one on each side of the steps, and which slots or grooves are for some distance, at their Inner ends, continued in a horizontal direction, whilst at their front or outer ends they are curved upwards to the side of the carriage, where they have recesses adapted to receive and retain the stude from the sides or connecting parts of the steps, and added by prolongations of these sides or connecting parts acting against parts of the frame in which the step slide serve to hold the steps correctly in position for use when drawn out and unfolded.—Patent completed.

nse when drawn out and unfolded.—Patent completed.

3555 W. H. IBBETT, Jewin-street, E.C. Inducing motion.
(A communication). Dated November 23, 1868.

This censists in a tube, conical or otherwise, through which the actuating body or motor is conveyed. Secondly, in a larger, longer, and similar tube, within which, and at the entrance thereof, the first-named tube is placed, the axis of both being in the same line. Thirdly, in a communication between the space outside the second tube, and the internal, between the two tubes, through which the body to be acted upon is drawn or conveyed. In some cases, the offices of the first tube and this last communication are transposed in the ancient as well as in the more modern devices, but such changes are immaterial—Patent completed.

3556 W. A. LYTTLE, Hammersmith. Electro-telegraphic apparatus. Dated November 23, 1868.

3556 W. A. LYTILE, Hammersmith. Electro-telegraphic apparatus. Dated November 23, 1868.

The inventor employs in the instrument known as the Morse printer or embosser two separate levers, with an inking roller or embosser to each, one of the levers being of soft iron and the other of magnetized steel, or iron kept constantly polarized by the proximity of a permanent magnet, and each lever having an end adjusted so as to be attracted by the electro-magnet underneath, as at present.—Patent abandoned.

sent.—Patent abandoned.

3557 J. STURROCK, Glasgow. Caps for boilles. Dated November 23, 1868.

This relates to an improved cap, to be applied to bottles or other vessels, for the purpose of sprinkling in small quantities or pouring out the liquids or fluids contained therein. The lower part of the cap is formed either of thin flexible metal, or of stiff metal, ivory, bone, wood, or other materials, and lined with cork, india-rubber, felt, or other elastic material, so as to fit tight over the neck of the bottle or other vessel. On the upper part of the cap a secondary removable cap or cover without openings is secured or otherwise fitted.—Patent abandoned.

3558 C. MONTAGU Connon-street E.C. Musical interva-

secured or otherwise fitted.—Patent abandoned.

3558 C. Montagu, Cannon-street, E.C. Musical instruments. Dated November 23, 1868.

This consists in constructing the case body or frame of the planoforte or other musical instrument of a foundation of wood or other ordinary rigid material, which, instead of being (as heretofore) veneered, is coated, covered, or faced with sheets, strips or thin pieces of india-rubber, or of a compound whereof india-rubber constitutes the main or principal ingredient. The material is moulded into form, or reduced by rolling pressure or otherwise, into thin sheets, which are cut or brought to the required shape. These are then cemented or attached to the wood or other foundation or material of the body, case, or main framing of the instrument.—Patent abandoned.

3559 A. V. Newton, Chancery-lane. Dressing millstones.

3559 A. V. NEWTON, Chancery-lane. Dressing millstones. A communication). Dated November 23, 1868.

3559 A. V. Newton, Chancery-lane. Dressing millstones, (A communication). Dated November 23, 1868.

Instead of employing the ordinary arrangement of the feed is facilitated. The sides of the furrows are parallel for the greater portion of their length, and they are formed by a combination of straight and curved lines.—Patent abandoned.

—Patent abandoned.

3560 W. E. Newton, Chancery-lane. Felted fabrics.
(A communication). Dated November 23, 1868.

This invention chiefly relates to an improved method of laying the fibre for bats, felts, waddings, and other similar goods, so that they may be crossed and interlaced in all directions for the purpose of causing them to adhere more firmly together, and thereby produce fabrics of durable quality. The fibres are formed into the bat by causing one sheet to be laid transversly back and forth on another sheet. Or on the fabric being built up is moved back and forth in the direction of its length past the place of receiving on its surface the first-mentioned sheet.—Patent completed. completed.

completed.

3561 J. R. SWANN, Edinburgh. Burning lime. Dated November 22, 1863.

The inventor provides pipes or channels surrounding the kiln or in close proximity to its sides, and he forces through such pipes or channels a current of air by means of a fan or otherwise. This air he leads into the kiln near the bottom, so that the fuel in the kiln is supplied with heated air, the cold external air being excluded.—Patent abandoned Patent abandoned.

mear the bottom, so that the fuel in the kild is supplied with heated air, the cold external air being excluded. Patent abandoned.

Patent abandoned.

3562 T. SMITH and J. N. N. BAZALGETTE, Langham Hotel, W. Deodorizing. Dated November 23, 1868.

The sewage or other fluid is introduced into the settling fank through openings in the wall of the tank at different heights, so as to obviate the disturbance caused in the process of precipitating the solid matter by the falling of the sewage stream from the upper surface of the tank wall; also communicating a slow horizontal rotary movement to the fluid at the level of its entry into the tank. A horizontal rotary motion may also be given by an open circular duct or ducts, constructed in the interior walls of the tanks delivering the sewage or other fluid at the level of the tanks delivering the sewage or other fluid at the level of the tanks and communicating a slow horizontal motion to the fluid at or near its surface. The form of the bottom of the tanks may be varied to suit the shape of the tank, whether square, round, oval, or otherwise. The bottom of the tanks may be varied to suit the shape of the tank, whether square, round, oval, or otherwise. The bottom of the tanks may be varied to suit the shape of the tank, whether square, round, oval, or otherwise. The bottom of the tanks may be varied to suit the shape of the tank is conical or pyramidal form or winking from the sides to the centre, or rising from all the sides to the centre, or at the four corners, or at the centre of the tanks is of the centre of the tanks. The deposit or residuum from the sewage on one or both sides, or at the four corners, or at the centre of the tanks into the drying beds in cases. Where the hydraulic pressure in the tanks into the drying beds in cases. Where the hydraulic pressure in the tanks into the drying beds in cases. Where the hydraulic pressure in the tanks into the drying beds in cases. Where the hydraulic pressure in the tanks into the drying beds in cases. Where the hyd

way, and so is filtered; or peat may be used as the filtering material.—Patent completed.

3563 W. H. DREAPER, Liverpool. Pianoforte hammer Dated November 23, 1864.

Dated November 23, 1803.

This consists in the use or application of india-rubber, by preference vulcanized india-rubber, in the covering of planoforte hammers.—Patent completed.

3564 J. E. PHILLIPS, Grantham. Sewing machines. Dated November 23, 1868.

3564 J. E. PHILLIPS, Grantham. Sewing machines. Dated November 23, 1868.

Two shafts or axes are employed one above and one below the cloth plate of the machine, and give motion thereto by means of toothed pinions fixed on the ends of shafts or axes driven by an internal toothed ring or wheel, as is now common with some descriptions of sewing machines, but india-rubber, gutta-percha, or compounds thereof, are employed in the construction of the gearing, in the following manner:—For the toothed pinions, the inventor first casts a boss or foundation wheel in metal with a ring or suitable projections thereon; he then places such boss or foundation wheel in a mould having suitable cavities formed therein for the teeth, and he fills the space in the mould not already occupied by the boss or foundation wheel with india-rubber, gutta-percha, or compounds thereof, and which he submits to the action of heat to "cure," and cause the compound to adhere firmly to the boss. For the internal toothed wheel or ring he first casts a plain ring of metal and then applies or forms the teeth therein in a somewhat similar manner to that described.—Patent abandoned.

3565 C. D. Abell, Chancery-lane. Cast iron. (A com-

the teeth therein in a somewhat similar manner to that described.—Patent abandoned.

3565 C. D. ABEL, Chancery-lane. Cast iron. (A communication). Dated November 23, 1868.

This process consists in mixing together cast iron and an oxide or oxides in such manner and in such proportions as to produce a solid (as distinguished from a fluid) mass, one of them being in a solid condition and the other of them a fluid state, by reason of heat applied to it previously to such mixing. The inventor uses cast iron either taken directly from the blast furnace or remelted, and for the oxydizing agent, ore crushed or pulverized may be most conveniently employed, although he does not desire to restrict himself to the use of any particular oxide. The mixing may be effected in any suitable receptacle or mould of such dimensions as will give to the resultant mass the desired shape and size. An ingot moulds, in two pieces, united and held together by bands, will answer the purpose. In the bottom of the mould he first places a small quantity of iron ore, so that the mixing may commence as soon as the melted cast iron is introduced. He then pours into the mould a stream of finely crushed iron ore, keeping the flow of each as steady as possible, and stirring them constantly with a tool (preferably madeo of wood) so as to effect an intimate admixture. Care must be taken that there shall be fully enough ore for the operation.—Patent completed.

ture. Care must be taken that there shall be fully enough ore for the operation.—Patent completed.

3566 T. CULPIN, Reading. Reaping and mowing. Dated November 24, 1868.

The beam is composed of two plates of steel fixed a given distance apart, thereby forming a trussed beam, giving greater rigidity with a given quantity of material.—Patent abandoned.

giving greater rigidity with a given quantity of material.

-Patent abandoned.

3567 J. H. Johnson, Lincoln's Inn. Raising and lowering verights. (A communication). Dated November 24, 1868. This relates, first, to certain improvements in the safety tackle, for which letters patent were granted to Pierre Joseph Jamet, dated April 3, 1865, No. 937. It is now proposed to introduce into the oscillating pulley block, described in the specification of the said patent, a binged brake which is acted upon by the fixed "crosspiece," and applies friction to the whole of the rope on the upper surface of the "return pulley" in lieu of one part only of such rope being nipped directly between the "crosspiece" and the pulley itself, whereby the rope was liable to become injured. According to the second part of this invention, the oscillating motion of the upper pulley block, as well as the special return pulley itself, are dispensed with, a ratchet wheel and detent hinged to a brake being substituted therefor. The ratchet wheel is mounted upon the axis of the sheaves, and into the tech of this ratchet wheel engages the detent which is hinged to the brake.—Patent completed.

3568 W. G. BEATHIE, Surbiton. Slide valves. Dated No-

3568 W. G. BEATTIE, Surbiton. Slide valves. Dated November 24, 1868.

abse W. G. BEATTH, SURDION. Side vaives. Dated Nomember 24, 1868.

This consists in constructing slide valves in such a
manner as to relieve them from or to reduce the pressure
of the steam thereon, and the consequent friction attending
their movement. For this purpose the inventor forms
the valve and the interior of the steam chest of a cylindrical
shape, and extends the steam ports partly round its circumference. He forms the steam port bars of loose circular
rings of metal, or other suitable material, in one or more
parts inserted in grooves in the steam chest, and compressed against the cylindrical valve by spiral or other
metallic springs, or by an adjusting screw arranged to
draw the ends of the rings together, so as to form a steamtight contact with the valve, and to compensate for the
wear of the valves and rings.—Patent completed.

3570 W. Carrer, Masham. Communicating in trains.

tension opposing each other; and the necessity of employing stays, as in iron fences, at present in use, is obvisted, stays, as in iron fences, at present in use, is obviated whilst the construction of a stronger fence is obtained-Patent completed.

Patent completed.

2573 H. E. NEWTON, Chancery-lane. Atmospheric hammers. (A communication.) Dated November 24, 1868. This relates to that class of hammers in which a cushion of confined atmosphere interposes between the lifting and striking power and the hammer itself, so that concussion on the actuating mechanism is relieved. A revolving crank and pitman, connected to a piston rod, is made use of. The piston of the rod is in an air cylinder, formed in the hammer itself. The piston rod passes through a stuffing box, and hence the confined air in the cylinder above the piston forms a cushion for lifting the hammer, and the air below the piston forms a cushion in striking the blow.—Patent completed.

Multiplying motion.

striking the blow.—Patent completed.

3574 H. E. NEWTON, Chancery-lane. Multiplying motion. (A communication.) Dated November 24, 1868.

The shaft is supported on the standards and carries the bevel wheel or disc, which is keyed thereto. The standard has a slot, to receive the pinion to connect the wheels. One of the wheels is cogged on both sides, and revolves loosely on the shaft. A lever or disc is made fast on the shaft, and carries a pinion which gears into this wheel, and also into a similar wheel, which also drives two similar wheels. All these wheels are provided with slotted lugs, to receive pinions for transmitting motion from one to the other. The two wheels last mentioned are allowed to revolve on the shaft.—Patent completed.

are allowed to revolve on the shaft.—Fatent completed.

3575 E. R. WETHERED, Shorncliffe. Signalling in trains.
Dated November 24, 1868.

The inventor arranges the apparatus in such a manner that in each carriage, or in a carriage or carriages, intermediate of the length of the train, power is stored up, either in a raised weight or spring, and this power is held available for giving the signal whenever required. The connections between the carriages are such that when the weight or spring is liberated in one carriage, it releases the weight or spring in the next carriage or carriages so furnished, and so throughout the train.—Patent completed.

3576 B. SOLOMONS, Albemarle-street, W. Meteorological indicators. Dated November 24, 1868.

The consists, first, in constructing thermometers with a vernier scale, by which the position of the mercury, or other fluid, is able to be ascertained, to the hundredth part of a degree, Centigrade, instead of to a tenth only, as heretofore.—Patent abandoned.

heretofore.—Patent abandoned.

3577 B. Hunt, Lincoln's Inn. Watches. (A communication.) Dated November 25, 1868.

This relates to a system of winding-up mechanism applicable to watches of all kinds, and by the aid of which the winding-up is performed in far less time and more easily than with any other system hitherto proposed or employed. The winder is formed by the back of the case itself, which is made movable, and acts on the ratchet of the barrel, which in this case is brought to the centre of the watch.—Patent abandoned.

3578 J. PARRY, Manchester. Springs for mattresses, &c ated November 25, 1868.

Dated November 25, 1868.
This consists chiefly in protecting the top of the spring by means of a top or cap of wood, metal, or other suitable substance, which top or cap is made preferably of a mushroom form, but it may be made oval, octagonal, or of other convenient shape.—Patent completed.

missircom form, but it may be made oval, octagonal, or of other convenient shape.—Patent completed.

3579 R. Lakin and W. H. Rhodes, Manchester. Spinning and doubling. Dated November 25, 1868.

This consists, first, in connecting the under faller and lever and brake lever, used for regulating the winding on by means of a spring instead of a chain. Second, in attaching the tension pulley on the headstock, used for tightening the rim band to one end of a lever, and applying a spring at the other end of the lever, to exert a force on the band, in order to produce the degree of tension necessary to ensure more regular turning of the spindles. Third, in hinging to the faller leg an elbow lever mounted on the stud, the lower end of which is connected with the faller leg. The object of the fourth improvement is to prevent the breakages which sometimes occur when the mule fails to make the change required to put the clutch box in connection with the back or drawing out shaft out of gear. To accomplish this the stude of one or more of the wheels, which are used for drawing out the carriage, are attached to the lever instead of to the frame side, as now customary.—Patent completed.

3580 W. WILD, Oldham. Driving shafts. Dated Novem

3580 W. WILD, Oldham. Driving shafts. Dated Novemer 25, 1868.

3530 W. Will, Oldham. Driving majis. Descend normalist 25, 1868.

The invention is designed for the purpose of equalizing and regulating the speed motion or velocity of revolving shafts, spinnles, and other machinery, by an adaptation thereto of a compensating movement, by which the time and speed of connected parts is provided for in such a manner that the resultant motion is entirely freed from "back lash."—Patent abandoned.

3581 G. BERNHARDT, Radcliffe. Regulating supply of gas

3581 G. BERNHARDT, Radcliffe. Regulating supply of gas Dated November 25, 1368.

This consists in arrangements and apparatus which will open a valve or tap to turn on the full pressure and supply of gas, when the driving power in a manufactory is set to work, and to shut the valve or tap, or turn off the full pressure and supply of gas when the driving power ceases to work. The invention may be carried into effect by various arrangements, but that which is preferred is an ordinary ball governor, given by or geared with some convenient shaft. The action of the governor, when it rotates, opens the valves, and when it ceases to rotate it closes the valves, which (if a lifting valve) is connected with the governor through an ordinary water or mercury sealed slide. The minimum supply of gas to allow of small lights, before the driving power begins, and after it ceases, may be allowed to pass through a small hole adjusted by a screw plug, or through a small tap.—Patent completed.

3582 T. CRAIG. Lincoln's Inn. Handing windows. Ar.

completed.

3582 T. Craffe, Lincoln's Inn. Hanging windows, &c. Dated November 25, 1868.

This consists in cutting a groove in one or both sides of either the sash or frame of the window or other fittings, to any required depth or width, and inserting therein one or more loose or detached rollers or wheels of indis-rubber, or other suitable elastic substance or compound of any required dimensions, which rollers, when the window sash is in its place in the frame, are, to a certain extent, compressed, thereby creating sufficient friction to maintain the



said sash in any position to which it may be adjusted, while, at the same time, the said rollers are free to roll in either direction to allow the sash to be easily moved. In raising or lowering the sashes, the rollers or wheels revolve, and travel within the groove for a distance proportioned to that traversed by the sash, and regain their original position when the sash is shut, either up or down, as the cuse may be. To facilitate the raising of the windows when they are of any considerable weight, it is intended to affix cords, working in pulleys, inserted in the top of the frames, one for each sash, similar to the cords of Venetian blinds. These rollers can be adapted to the windows of railway carriages, or of any other structure. or venetian blinds. These rollers can be adapted to the windows of railway carriages, or of any other structure—Patent completed.

-Fatent completed.

3583 P. SPENCER. Nowcastle-upon-Tyne. Preparing indigo blue Dated November 25, 1863.

This consists in spreading the indigo upon sheets of paper, linen, calico, or other like material instead of making it up into balls or "thumbs," as heretofore. In making use of the indigo thus prepared or made up. a slip of the sheet is cut off and put in the water.—Patent abandoned.

of the sheet is cut off and put in the water.—Patent abandoned.

3584 W. R. LAKE, Chancery-lane. Manutacturing cigars. (A communication). Dated November 25, 1868.

This consists in the general construction of the machine, and more particularly in the application, form, and arrangement of a number of non-elastic rollers, between which the cigar is formed, and in the use of a follower, to prevent the cigar from being too long, of a header for forming a point, and of a cutter for cutting and trimming the thick end of the cigar.—Patent completed.

3585 S. Brook and C. Thompson, Halifax. Looms. Dated November 25, 1868.

This relates to means of acting upon the "swell" in looms for weaving, so as not to press upon the shuttle any time, except immediately after the shuttle has got into the box, and which is relieved again before the shuttle is picked or sent out of the box. This is effected by means of a lever hinged to the loom end, and extending over or under the crank shaft, and also under the lathe or going part of the loom. A bracket with a friction roller is fixed on the stop rod, and can is fixed on the crank shaft, which, as the said shaft rotates, acts upon the lever, and through it on the stop rod, and, consequently, on the swell in like manner.—Patent completed.

3586 D. S. Merry, Hackney. Arm protectors. Dated

8586 D. S. MERRY, Hackney. Arm protectors. Dated November 25, 1868.

The inventor forms a covering for the arm of leather The inventor forms a covering for the arm of leather or other suitable waterproof or fireproof material or combination of materials, to fit closely round the wrist by means of an elastic gusset, or by buttons, hooks buckles, or other suitable means applied at that part. These protectors may extend from the elbow to the wrist, or they may be made long enough to protect the arm from the shoulder downwards to the wrist; in which case, when made of rigid or comparatively rigid material, it will be made in two parts, connected together at the elbow by means of a suitable elastic or flexible tube or connection.—Patent abandoned.

2357 W. F. Chapman Llandudgo, Packing case, Datad.

—Patent abandoned.

3537 W. F. CHAPMAN, Llandudno. Packing cass. Dated November 25, 1868.

The inventor makes a series of trays or shallow boxes, open at top, which, when piled one upon another, form a package resembling an ordinary packing case. The bottom tray is provided with a vertical rod at either end fixed firmly outside the tray. The said rods are of a length equal to the depth of the series of trays combined together, and the tops of the said rods are screwed and are provided with screw nuts. Each of the other trays is provided at each end with an eye or loop, through which eyes or loops, when the trays are piled upon one another, the rods fixed to the bottom tray pass.—Patent abandoned.
3538 G. BAKKE, iun. Birmingham. Birmleans. Dated

eyes or loops, when the trays are piled upon one another, the rods fixed to the bottom tray pass. —Patent abandoned.

3588 G. Baker. jun., Birmingham. Bird cage. Dated November 25, 1868.

This consists, first, in making the bases or bottoms of bird and other cages of papier mache. These bottoms are made, by preference, of a disc of a larger diameter than the cage. This disc has a raised concentric ring or rim of somewhat less diameter than the body of the cage. The body of the cage is dropped around and secured to the ring or rim in the following manner:—On one side of the ring or rim in the following manner:—On one side of the ring or rim and at a short distance apart, one or two small metallic tongues are fixed, and opposite the said tongues is aspring catch fastening. In a ttaching the body of the cage to the bottom, one side of the metal band at the bottom of the body is inserted under the tongues, and the opposite side of the said band is passed into the spring catch fastening. In this way the body of the cage is secured around the rim of the bottom. In order to liberate the body from the bottom, the movable part of the spring catch fastening is pulled by the thumb and finger when the body becomes detached from the bottom. The method of fastening described may be applied to cages having bottoms of metal or other hard material, the bottoms having the raised rim or ring described with reference to papier mache bottoms.—Patent completed. or ring described with reference to papier mache bottoms Patent completed.

—Patent completed.

3599 W. E. Gedeg, Strand. Tug boat. (A communication). Dated November 25, 1868.

An endless chain or iron wire cable thrown into the watercourse along the whole line to be worked, and fixed only at the up-stream end, serves as fulcrum to the travelling tag resisting the traction of this latter by its weight alone. Thus the most powerful tugs may be attached to it at a distance from each other of less than 1,094 yards (I kilometer), and mount the stream without those up stream being in any way hindered by the traction or pulling of those belowat the bends. Movable guilets keep the fulcrum in the centre of the breadth of the stream.

—Patent abandoned.

Patent abandoned.

3590 W. E. Geder, Strand. Sweing machines. (A communication). Dated November 25, 1868.

In making embroidery work on a sewing or embroidery machine, the great difficulty occurs in making curves, circles, or other intricate design, the entire cloth has to be turned constantly in conformity with the design to be unded, and for this reason that description of embroidery work is not only difficult to execute but can be executed with a very moderate degree of speed only. To avoid this difficulty, the inventor has combined the several working parts of an embroidery machine in such a manner that a universal feed motion causes the cloth to move in any desired direction, and that the hooks or needles which make the stitch move in combination with said feed motion, so as not to change their relative positions to each other; thus embroidery work of the most intricate design

can be made without turning the cloth.—Patent com-

3591 H. SMITH. Westbourne-terrace-road, W. Playing

3591 H. SMITH, Westbourne-terrace-road, W. Playing games. Dated November 25, 1868.

A block of a polygonal form is employed, and it is padded round the edges with vulcanized india-rubber or other clastic material. This block is adapted to stand in the centre of a circular or other table, and it may support a lamp to throw on to the table the uniform light which the game requires. The surface of the table is covered with a woollen cloth having a circle marked upon it, which may conveniently be from 3ft, to 4ft, in diameter, and this circle is divided up into as many equal segments as there are sides to the block.—Patent abandoned.

and this circle is divided up into as many equal segments as there are sides to the block.—Patent abandoned.

3592 E. T. VAN HECKE, Courbevoie, Paris. Steam boilers, Dated November 25, 1808.

The boiler is formed of cylindrical plates of metal with a dome-shaped top or steam chest. The firelox is also cylindrical with a dome-shaped top, and the bottom of the boiler and flrebox rest upon and are affixed to an annular flat plate of metal with water space between the two. A series of tubes extend from the top of the flrebox to the top of the boiler, to which parts the tubes are fixed watertight by their ends. The inventor surrounds the boiler with a jacket of metal for a portable or locomotive boiler, and with brickwork for a stationary or fixed boiler, the space between the boiler and jacket being for the passage of the heat, gases, and smoke from the furnace fire, and on a line with the bottom of the boiler and firebox, and in a line with the bottom of the boiler and firebox and in a line with the bottom of the boiler and firebox and in a line with the bottom of the boiler and firebox and in a line with the bottom of the boiler and firebox and in a line with the bottom of the boiler and firebox and in a line with the bottom of the boiler and firebox and in a fire with the bottom of the boiler and firebox and in a fire with a firebox and in a line with the top of the boiler. He forms two short horizontal flues leading from the flue that surrounds the boiler should be affixed the firebox and in a line with the top of the boiler. He forms two short horizontal flues leading from the flue that surrounds the boiler should be affixed to the formation of the boiler.

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Patent completed.

Patent completed.

3593 N. D. SPARTALI, Liverpool. Heating boilers. Dated November 25, 1863.

This relates chiefly to the economic and efficient application of liquid hydrocarbon as a fuel for heating steam boilers, whether marine, stationary, or locomotive. In adapting the invention to marine boilers, as at present constructed, the inventor applies to the fire chambers or furnace a cylindrical auxiliary or supplementary boiler with one or more longitudinal fire flues passing through it, and he supplies liquid fuel to the fire flues (in which it is ignited) to heat the same in the following manner:—The liquid fuel is forced (in the form of spray) into the fire flues by high pressure steam or heated air admitted to the feed pipe in rear of the mouth or discharged end. Air may also be admitted direct to the fire flue to fan the flame of the ignited fuel and increase its intensity if required.—Patent completed.

3594 J. BUENNE. Leith, North Britain. Production of

required.—Patent completed.

3:594 J. BOURNE, Leith, North Britain. Production of heat and motive power. Dated November 25, 1868.

The inventor produces motive power by means of the heat derived from combustibles, as is done in the steam engine. But he generates the heat in a different way from that adopted in the case of the steam engine, and he transforms the heat into motive power by a method not heretofore in use, and with a smaller consumption of fuel than by any method yet practised. Patent completed.

than by any method yet practised —Patent completed.
3595 H. MILSTED, City-road, Buckles. Dated November 25, 1868.
This buckle consists of two parts combined, that is to say, the sides or lateral arms of the frame of the buckle instead of being, as is usual, each a solid or continuous piece, are spring arms or sides, that is to say, each such side consists of a rod, bar, or arm entering a hollow or tubular rod, bar, or arm, and used in combination with a spring. The tubular arms are capable of sliding on or over the inner arms, or the inner arms of sliding in the tubular arms.—Patent abandoned.

2596 W. R. Lake, Chapperylane, Statistics, 14 com-

over the inner arms, or the inner arms of stiding in the tubular arms.—Patent abandoned.

3596 W. R. Lake, Chancery-lane. Sad irons. (A communication). Dated November 25, 1868.

This consists, first, in the combination with a reversible sad iron, provided with a suitable burner, of a reservoir for containing oil or other hydrocarbon liquid so connected to the sad iron as to supply the burner with the necessary quantity of the oil or other hydrocarbon liquid. Also, in the combination with the r servoir and sad iron of devices or mechanism for heating the iron by generating and burning within the same the vaporous products of the oil or other hydrocarbon liquid. Also, in a burner of novel construction, with which is combined a vapour generating chamber. Also, in the arrangement of a valve and means for operating the same, whereby the flow of the hydrocarbon liquid may be regulated as desired. Also in constructing the inner surfaces of the smoothing plates of the iron with radial corrugations, whereby a more uniform heating of the smoothing plates of the iron is effected.—Patent completed.

3597 D. Vogl. Basinghall-street. Fustening scarres. (A

3597 D. Vool, Basinghall-street. Fastening scarres. (Acommunication). Dated November 25, 1868.

3597 D. Vool., Basinghall-street. Fistening scarres. (A communication). Dated November 25, 1868.

The inventor uses an appliance consisting of two bars or plates. One of these bars or plates, which he calls the working plate, is suspended or jointed to, or mounted in the other. This bar or plate has projecting parts at the ends of its upper edge on each side, which projections engage and work in bearings formed by, or in, bent up or projecting parts formed at the corresponding part of the other plate or bar.—Patent abandoned.

other plate or bar.—Patent abandoned.

3598 E. ELLENBAND, Manchester. Needles. (A communication). Dated November 25, 1868.

This consists of a metallic tip containing passages at right angles to one another, into one of which the needle to be threaded is inserted with its eye downwards, and through the other (which is enlarged at its mouth to allow it to enter easily) the thread is pushed in the same way as threading a needle, the only difference being that, instead of having to pass the thread through a minute hole, it is pushed into a funnel-shaped passage, and such is the peculiar action of the hole so formed that the thread causes the needle to assume the proper position to allow the thread to pass through its eye and out at the other extremity of the hole. This done, the needle is pulled out, and the thread follows it through the same hole, when the needle will be found to be threaded and ready for use. needle will be found to be threaded and ready for use. Patent abandoned.

3599 L. ROMAN, Paris. Hydraulic motive power. Dated

November 26, 1868.

November 26, 1868.

This consists in two endless chains formed of bars of flat iron, with articulated joints and curved paddles fixed on these bars. These paddless are kept perpendicular and parallel to each other at suitable distances apart, so as to

form an endless chain of paddles, which chain is laid over form an endless chain of paddles, which chain is laid over two or more drams, pulleys or wheels, the ares of which are situate parallel to the level of the water, and revolve in vertical stundards provided in boats or other suitable movable or fixed supports; the said endless chain is laid in the direction of the current, and kept at such height that the paddles of the lower portion of the chain are immersed perpendicularly in the water, whilst the remain-der of them are out of this latter.—Patent abandoned.

immersed perpendicularly in the water, whilst the remainder of them are out of this latter.—Patent abandoned.

3600 F. Holl, Gorton. Steam engines. Dated November 26, 1863.

The object is to reduce the friction in the working surface of steamengines of an improve I lubricating apparatus, and to prevent the escape of steam in the stuffing boxes, by means of an improved metallic packing. The lubricator consists of a vessel provided above and below with a valve seating. The spindle of the upper valve is serewed into the spindle of the lower valve, and the upper and lower valves, and are held upagainst their seatings by the spring which abuts against the fixed washer and the loose washer placed below the boss of the hand wheel fixed to the spindle. The upper valve is opened to pour the lubricant into the vessel, by screwing the upper into the lower rapindle, and it is closed by turning the spindle in the contrary direction. When the cylinder or other part requires to be lubricated, the lower valve is opened by turning the upper spindle, to allow a portion of the lubricant to flow out of the vessel, through the elbow plps, the upper part of the spindle, which is made with diagonal perforations to convey the lubricant into the pipe. The quantity of lubricant allowed to escape is governed by the diameter of the shoulder on the spindle passing through the opening above the seating —Patent completed.

3601 P. BANTON, Craven-hill, W. Firearms. Dated November 26

the seating —Patent completed.

3801 P. Banton, Craven-hill, W. Firearms. Dated November 26, 1868.

The object is to effect the ignition of the charge by friction instead of by percussion. The inventor prepares cartridges with nipples charged with matter which is readily ignited by friction, such as the mixtures ordinarily employed for lucifer matches. In the lock of the arm to which the invention is applied, instead of the hammer ordinarily employed for striking a percussion cap, a stiding piece is used, which can be pulled back by hand, and which is urged forward by a spring. This sliding piece has notches into which a detent, connected with the trigger, engages, so as to hold it back until the indent is released, by pulling the trigger, in which case the spring causes it to slide forward.

—Patent abandoned.

2602 A. M. CLARK, Chancery-lane. Sizing threads. (A communication). Dated November 26, 1868.

This consists in a preparation formed by the combination or mixture of the following substances in about the following substances in a substance in the following substances in the following substances in a substance in a substan or mixture of the following substances in about the following proportions:—Gelatine, 13lb.; dextrine, 8.lb.; sulphate of lime, 1lb.; glycorine, 110lb.; chloride of calcium, 1;0z.; spermaceti, 1lb.; phenic acid, 1;0z.; caustic sods, 3oz.; syrup of fecula, 11lb.; stearine, 4;lb.; starch, 12lb.—Patent completed.

3603 J. Sincock, Birmingham. Ratchet braces. Dated November 26, 1868.

This consists in the employment of a sliding pawl acted

This consists in the employment of a sliding pawl acted upon by a belieal spring, enclosed in a spring box, for actuating the ratchet wheel of a ratchet brace or lever. The shiding pawl, spring, and spring box (which latter may be provided with a screwed cap or cover, for the facility of removing the pall and springs), are all contained in the head of the actuating lever of the brace, and access to the ratchet wheel can be obtained by removing the hoop or bush which serves to keep the ratchet wheel in its place. This hoop is held in its place by two or more screws, on removing which all the parts can be readily taken out—Patent completed.

3604 H. SWITHENBARK LAWFERCE-lane. Manufacture of

Patent completed.

3604 H. SWITHENBANK, Lawrence-lane. Manufacture of hats. (A communication). Dated November 26, 1868. The inventor makes the potence receive, in addition to a half block, which is held stationary, whilst in use, a whole block which can be turned round whilst the hat is upon it, so as to expose every part of the hat in turn to the iron, or it may be the brush which is being used. In place of fixing the rectangular projection rigidly to the standard, as heretofore, he arranges it to turn upon a joint, so that instead of projecting to the front, as it does when in use, and when the half block is upon it, it can be turned to the back, out of the way, and he also mounts similarly on the same standard a stud or pin which is turned to the front when the whole block is to be used, so as to stand out horizontally from the front of the standard.—Patent abanhorizontally from the front of the standard.-Patent aban

doned.

3605 G. E. SPOONER and G. A. HADDART, Bron y Garth, Carnarvon. Rathways. Dated November 26, 1868.

The abutting ends of the rails, whether they be double headed or formed with a flat base, the inventors propose to clip between two plates, suitably shaped to embrace the web, and the foot or lower head of the rail, and by preference to extend vertically a sufficient distance below the rail to admit of being pierced to receive clamping boits. The plates they secure like ordinary fish plates to the rails, by passing boits through them and through the webs of the rails and by the additional bolts below the base of the rails, the coupled ends are held as in a vice; the vertical continuation of the plates below, the rails are made of a sufficient depth to act as an under girder or plate to stiffen the joint.—Patent abandoned.

3606 A. Busche, Schwelm. Making laces and braids.

mepta to act as an under girder or plate to stinen the joint.

—Patent abandoned.

3606 A. Busche, Schwelm. Making laces and braids.
Dated November 26, 1838.

This consists in an improved arrangement of the carriers, for enabling the machines to occupy much less space than those at present in use. Instead of placing all the car, iers in one concentric circle, as hitherto, the inventor divides the gross number into two unequal numbers. In the larger of these numbers, two of the carriers are drivers, their pinions being geared into a driving toothed wheel. The pinions of the drivers gear into the pinions of two other carriers, and the pinions of the hatter into two others, and so on, continuing in a concentric circle. The remaining number of carriers are placed in pairs in a concentric circle around the inner series, and the pinions of each pair gear into the pinions of two of the inner carriers. The two driver carriers revolve in the same direction, and all the other carriers revolve in opposite directions to each other, as in the old machines.—Patent completed.

3607 E. T. Hughes, Chancery-lane. Dessing stone. (A communication). Dated November 26, 1888.

This consists in placing the stone or other substance on

3607 E. T. HUGHES, Changes, communication). Dated November 26, 1868.
This consists in placing the stone or other substance on a movable platform or turntable, and causing a suitable tool to revolve against the edge or surface required to be dressed.—Patent completed.



3608 H. POLLACK, Hamburg. Breech-loaders. Dated

3603 H. POLLACK, Hamburg, Breech-loaders. Dated November 26, 1868.

This consists in securing to the stock of the gun by a screw, a metal pipe having at the topan indented opening, and at the fore end an internal screw, to which the barrel is screwed, either with or without a seating. In this pipe is placed a metal cylinder, open at the back, but having outside the hole a projecting cam, to be used as a presser, and at the other end the cylinder carries the locker, which consists of a flat head in contact with an india-rubber washer, between which and the end of the cylinder there is a layer of leather. The head is formed on a screwed pin having a hole in the centre for the needle to pass through, and the pin is fixed to the cylinder from the inside, by means of a screw nut, there being a long key adapted for the purpose, and the inside of the cylinder is cleaned by a chamber cleaner when required.—Patent completed.

3609 W. R. Lake, Chancery-lane. Paddle wheels. (A

by a chamber cleaner when required.—Patent completed.

3609 W. R. LAKE, Chancery-lane. Paddle wheels. (A communication). Dated November 26, 1868.

This consists in pivoting the blades of paddle-wheels in the centre of their width, so that they can freely turn to accommodate themselves to such position as will offer the least resistance to their entrance into the water, and, as soon as submerged, assume and maintain the perpendicular position until the wheel in its revolution raises the urper edge out of the water. The blade will then directly assume the best possible position to pass up out of the water with the least resistance, viz., an incline, so that it raises no water, and, consequently, there is no loss of power. One method of carrying this invention into effect is to have the convex side of the blade, or that part that is below the axial line, forward, so that the convex curvature will be in advance of the terminus of the curve at the lower edge of the blade, and the upper wing of the blade will have the concave side forward, and the result will be that when completely submerged, the blade will assume the perpendicular position, and keep such position as long as it is so submerged.—Patent completed.

3610 W. R. LAKE, Chancery-lane. Harvesting machines.

dicular position, and keep such position as long as it is so submerged.—Patent completed.

3610 W. R. Lake, Chancery-lane. Harresting machines.
(A communication.) Dated November 26, 1868.

These machines are constructed with a toothed wheel, disc, or head, supported by its hub on a stem or post, which is continuously revolved when the machine is in motion by a pinion fixed on the shaft, which is turned or driven from the main carrying and driving wheel by or through the toothed wheel, which meshes with a pinion on the end of another shaft, and thus drives it. The opposite end of this last shaft has a bevel wheel upon it, which works on a bevel wheel on the shaft, which is thus driven, and, in turn, drives the wheel disc, or head. In bearings upon the wheel, but remote from its centre, are hung crossed axles, which are bent at their line of crossing, so that they may pass each other, and still revolve, though hung in the same plane. Upon these cross shafts are journals, set at right angles to each other, or nearly so, and also remote from the centre of the wheel, and upon these journals the hubs of the rake or reel arms are placed, and they revolve with them, and at the same time they can roll upon them, to make them act as rakes or beaters at the will of the operator, who rides on the machine. Upon each of the hubs there are three studs or projections. There is also a slot in each hub, through which a pln passes into its journal, and which pin and slot define the extent of the rolling motion of the rakes or beaters, whilst the lugs, studs, or projections citer aid in turning the rakes or beaters or prevent their turning, as the case may be.—Patent completed.

3611 J. H. Morrian, Belfast, and J. Coulong, Blackburn. Paymantic lown.

either aid in turning the rakes or beaters or prevent their turning, as the case may be.—Patent completed.

3611 J. H. Moreland, Belfast, and J. Coulong, Blackburn. Preumatic tooms. Dated November 26, 1863.

This relates, first, to an improved mode of constructing the shuttle boxes of pneumatic looms, the object being to render them more perfectly airtight, while they offer less friction to the shuttle on its entrance and exit than heretofore. To this end, the inventors line the shuttle boxes with corkwood of about one-quarter of an inch in thickness, and extend the lining for about two-thirds the length of the shuttle. The boxes may be formed outwardly of wood or iron, and fastened to a slay in the usual manner. If the boxes be of wood, the patentees fit wrought iron straps, on having set screws on the front and top sides, for contracting the diameter of the box, to compensate for the diminution of size of the shuttle by friction in working. The invention relates, second, to a novel mode of obtaining the pick in pneumatic looms. This object is attained by fitting on each end of the crank shaft an additional crank or eccentric of about the same throw as the crank used for working the slay, and fitting on the back of the slay, at or near the ends thereof, two light metallic cylinders, which communicate with the shuttle boxes, and in which work pistons, connected respectively to the cranks or eccentrics on the crank shaft ends. These pistons and cylinders act like air pumps, and thus impart the required reciprocating motion to the shuttle.—Patent completed.

3612 A. Harris, Thame. Warming buildings. Dated

3612 A. HARRIS, Thame. Warming buildings. Dated

November 26, 1868.

This apparatus consists of a firebox with an ashpit. From the top of the firebox a quantity of round, square, or any other shaped pipes, varying in number from three and upwards, terminating in a smokebox, whonce they proceed into a chimney. The external cold air is introduced by a pipe or air passage, leading into the ashpit to the fire, up through the smoke pipes, into the smokebox, and up the chimney, and can be stopped off by valve at pleasure. The air is conducted from the most extended and coldest parts of a building, through pipes or air passages, regulated by ventilators or gratings into an air chamber, formed in the lowest portion, passing through openings into a space forming the exterior of the firebox, circulating round the same and between the pipes. It then passes out at the top or sides of the apparatus, through apertures or gratings into the building, causing a continual circulation of hot air throughout the building. Cold air is likewise supplied the at bottom of outer casing through the pipe, for ventilation, and is stopped off by a valve at pleasure. At the top of the smokebox is a vessel, in which water is placed, by the evaporation of gratings.—Patent completed.

3613 E. STEVENS, Islington. Sharpening knices. Dated

vessel, in which water is placed, by the evaporation of which the hot air is moistened before passing out through gratiugs.—Patent completed.

3613 E. STEVENS, Islington. Sharpening knires. Dated November 27, 1868.

This consists, in the first place, in the forming, employment, and mounting of solid cones and not hollow or drilled through, to be fixed by screws, rivets, or otherwise.

These solid cones are formed smooth, fluted, grooved, or rough, and equal in shape, size, or circumference. The

inventor fixes the solid cones on suitable thin flat top and bottom plates. He makes a hole of the bottom plate, into which bpin or screw.—Patent completed. he inserts a flat-headed

# APPLICATIONS FOR LETTERS

Dated June 1, 1869.

1685 F. A. Calvert, Manchester. Improvements in engines for obtaining motive power.

1686 T. R. Clarke, W. Bywater, T. Lawson and C. L. Lister, Leeds. Improvements in the manufacture of felted fabrics, and in machinery employed therein.

1687 A. Rushworth, Finkhill-street, St. Nicholas, Nottingham. Improvements in circular knitting machines, and in the fabrics produced thereon.

1688 C. H. Gardner, West Harding-street, Fetter-lane, City. An improved lubricator.

1689 O. Barrett and G. P. Wheeler, Mitcheldean, Gloucestershire. Improvements in the manufacture of mortar for building purposes.

1690 J. Warhurst, Whaley Bridge, Cheshire. Improved apparatus for closing the aperture or opening at the bottom of hinged doors, shutters, and windows, for excluding draughts, dust, or rain. ing draughts, dust, or rain. 1691 H. Browning, Salmon-lane, Limehouse, Middlesex.

Improvements in compositions suitable for use as varnish or paint.

or paint.
1692 J. S. Stubbs, Fenton-terrace, Lincoln. Improvements in steam engines, and in stufling boxes used therein, and for other purposes.
1693 C. F. Waldo, Bread-street, Cheapside, City. Improvements in sewing machines.
1694 J. A. Bindley, Burton-on-Trent. An improved attemperator for union and tunning casks used in brewing. ing.

Dated June 2, 1869.

1695 M. Wrigley, Oldham. Improved apparatus for the prevention of accidents upon railways.

1696 R. B. Cooley, Nottingham. Improvements in the manufacture of hats or other coverings for the head, and in machinery or apparatus employed in such manufacture.

in machinery or apparatus employed in such manufacture.

1697 J. Fletcher, Ashton-under-Lyne. An improvement in steam and other cocks applicable to union joints, which he calls union cocks.

1698 J. Urbein, Ivry-sur-Seine, near Paris. Improvements in wax and other like candles.

1699 A. Watt, New Cross, Kent, and T. Knowles, Edgbaston, Birmingham. Improvements in the manufacture of printing surfaces, parts of which improvements are also applicable to the securing of metals to the surfaces upon which they have been deposited from solutions.

1700 G. V. Turnbull, C. Salvesen, and R. Irvine, Leith, Mid Lothian. Improvements in the manufacture or preparations of lubricants or softeners, and the application of the same to the treatment of hemp, jute, flax, and other like fibrous materials.

1701 B. J. B. Mills, Southampton-buildings, Chancerylane. A low-water indicator or alarm for boilers.

1702 N., G., and E. Smith, Thrapston, Northampton. Improvements in the mode of cutting and skiving leather and other materials, and in means or apparatus employed therein.

1703 J. H. Smith, East-road. Citv-road. London N.

therein.
1703 J. H. Smith, East-road, City-road, London, N.

therein.

1703 J. H. Smith, East-road, City-road, London, N. Improvements in velocipedes.

1704 E. Bemeimans and A. V. Volxem, Brussels. An improved apparatus for working the signals and switches or points of railways.

1705 F. R. A. Glover, Brading, Isle of Wight. Improvements in anchors.

1706 H. Larkin, Torriano Cottages, Leighton-road, Middlesex, and W. White, Thurlow-road, Hampstead, Middlesex, Improvements in the manufacture of magnesium, and in the preparation of its anhydrous chloride.

1707 T. B. Worth, Severn Valley Carpet Mills, Stourport, Worcestershire. Improvements in the manufacture of carpets, coach lace, and other terry fabrics.

1708 C. Francis, Austin Friars, City. Improvements in the construction of railway goods waggons.

1709 C. Francis, Austin Friars, City. Improvements in the construction of moorings.

1710 A. L. Simpson, Stowmarket, Suffolk. Improvements in compositions suitable for treating sheep attacked by fly, and for destroying the maggot, and for other similar purposes.

Dated June 3, 1869.

1711 C. Ostlund, Chiswell-street, Finsbury-square, Mid-

Dated June 3, 1869.
1711 C. Ostlund, Chiswell-street, Finsbury-square, Middlesex. Improvements in lamps for heating and lighting purposes, and in apparatus appertaining thereto.
1712 B. F. Weatherdon, Chancery-lane. An improved safety bag for conveying despatches or other articles of value by safety.

alue by sea. 1713 J. Hopkinson, Leeds. Improvements in the manu-

1713 J. Hopkinson, Leeds. Improvements in the manufacture of artificial fuel.

1714 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in apparatus for generating steam and for heating and cooling fluids.

1715 J. Lloyd, Lilleshall Irou Company, near Shifnal, Salop. Improvements in the construction of fans for ventilating.

1715 J. Lloyd, Lilleshall Irou Company, near Shifnal, Salop. Improvements in the construction of fans for rentilating.

1716 J. Stewart, Poplar, Middlesex, and T. Charlton, Ashford, Kent. Improvements in and additions to, multitubulous and water sheet steam boilers and their fire-boxes or furnaces, such improvements being applicable in part to surface condensers and refrigerators.

1717 F. Rave, Manchester. An improved method of extracting colour from vegetable matter.

1718 J. and R. Tatham, Roehdale. Improvements in machinery for carding wood and other fibrous materials.

1719 W. V. Morgan, Cannon-street City. Improvements in the manufacture of crucibles and other refractory articles or vessels.

ventilating the same, the said improvements being also applicable to steam tugs, pilot boats, tenders, and other floating bodies.

Dated June 4, 1869.

1724 J. Edge, Bolton-le-Moors, Lancashire. Improvements in steam engines, and in apparatus employed in connection therewith.

1725 E. S. Jones, Liverpool. Improvements in veloci-

connection therewith.

1725 E. S. Jones, Liverpool. Improvements in velocipedes.

1726 E. T. Hughes, Chancery-lane Improvements in machinery for the manufacture of wood-boring instruments and in auger bits.

1727 J. Farmer, Cannock, Staffordshire. Improvements in reaping and mowing machines.

1728 T. Best, Faunce-street, Kennington Park, Surrey. Improvements in the manufacture of velocipedes.

1729 W. H. Nicholson, Market-street, Manchester, Improvements in travelling portmantesus, and in the method of fastening the same.

1730 G. W. Ley, St. John's-road, Croydon, Surrey, Improvements in the manufacture of ornamental articles in wood in imitation of carving.

1731 J. Duke, Havelock House, Mannamead, near Plymouth. Improvements in the manufacture of plaster and cement.

1732 E. M. Syer, jun., Navarino-road, Richmond-road, Dalston, Middlesex. Improvements in the manufacture of sleepers to be employed for the permanent ways of railways and tramways, and for the foundation of palisades or railings.

railways and tramways, and for the foundation of palisades or railings.

1733 R. B. Plum and R. George, Worcester. Improvements in sewing machines, part of which improvements
is also applicable to other machinery in which rotary
motion is to be converted into reciprocating motion.

1734 F. Lowis, Dublin. Improvements in bottles or
ressels for perfumes, medicines, and other liquids, and in
the stoppers of such bottles or vessels.

1735 G. E King, New York, U.S.A. An improvement
in fluted, crimped, and puffed fabrics adapted for use
as trimmings and for similar purposes.

1736 J. Blomfield, Colchester, Essex. Improvements in
sewing machines for the manufacture of boots and shoes
and for other purposes.

1737 T. Wilkins and W. Fisk, Ipswich, Suffolk. Improvements in machinery or apparatus for slicing cacumbers and other vegetables for culinary purposes.

Dated June 5, 1869.

provements in machinery or apparatus for slicing cacumbers and other vegetables for culinary purposes.

Dated June 5, 1869.

1738 A. B. Childs, Mark-lane, Middleser. Improvements in machinery for cleaning and decorticating wheat and other grain, hulling, cleaning, and polishing rice.

1739 H. Downey, Corstorphine, Mid Lothian, and I. B. Harris, Edinburgh. Improvements in shoes for horses.

1740 E. G. Brewer, Chancery-lane. Improvements in the construction and application of brakes to railway carriage and waggon wheels.

1741 K. Cook, Bishopwearmouth, Durham, and G. Hauxwell, Durham. Improvements in apparatus for decorticating and cleaning grain and seed.

1742 T. W. Arkle, Liverpool. Improvements in extracting, recovering, or collecting copper from water containing the same in solution.

1743 A. Wiglesworth, Liverpool. Improvements applicable to curtain poles for beds and other purposes.

1744 F. H. Holmes, Mortlake, Surrey. Improvements in electro-magnetic machines.

1745 R. Law, Burnley, Lancashire. Improvements in or applicable to, throstle spinning and doubling frames, and machines of like character.

1746 A. C. Engert, Tabernacle-row, Middleser. Improvements in the manufacture of plain and ornamental mouldings for picture frames and other uses, and in apparatus therefor.

1747 H. Kinsey, Robin Hood Works, Nottingham. Improvements in steam and other boilers, and in surface 1747 H. Kinsey, Robin Hood Works, Nottingham. Im-rovements in steam and other boilers, and in surface

provements in steam and other botters, and in surface condensers.

1748 A. M. Clark, Chancery-lane. Improvements in machinery for producing and applying motive power, and also in the parts connected therewith.

1749 J. and S. W. Varley, Leeds. Improvements in machinery to be used in the treatment of wool, flax, silk, and other fibrous materials.

1750 W. B. Leachman, Leeds. Improvements in boilers for generating steam, and in apparatus for warming buildings, and for other purposes.

ings, and for other purposes. 1751 F. Hohmann, Ipswich, Suffolk. Improvements in

sewing machines.

1752 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in reins for controlling saddle

Dated June 7, 1869.

1753 G. A. Frebault, Avenue des Ternes, Paris. An

1753 G. A. Frebault, Avenue des Ternes, Paris. An improved electoral hox.
1754 C. Gall, Halifax. Improvements in steam boiler and other furnaces.
1755 B. F. Weatherdon, Chancery-lane. An improved tension swivel-coupling for nautical and other purposes.
1756 J. G. M'Kirdy, Birkwood, Lesmahagow, Lanarkshire. An improved stile or biped pass for parks or other enclosures.

1756 J. G. Mikruy, Birkwood, Essimanago, Lanarashire. An improved stile or biped pass for parks or other enclosures.
1757 H. Smith, Hereford. Improvements in resping and mowing machines.
1758 F. Heckner, Brunswick. An improved arrangement of encless sawing machinery.
1759 W. Sellers, Airedale Works, Keighley, Yorkshire. Improvements in sewing machines.
11760 G. Fenner, Fletching, near Uckfield, Sussex. Improvements in bits for horses.
1761 T. G. Greenstreet, New Kent-road, Surrey. An improved street-sweeping machine.
1762 W. E. Newton, Chaucery-lane. Improved apparatus for folding printed sheets of paper.
1763 E. Tavernier, Rue Beauharnois, Lille, France. Improvements in apparatus for combing wool, cotton, and other fibrous substances.
1764 C. E. de Loriere, Great Suffolk-street, London. Improvements in linsed buttons and studs for fastening cuffs, wristbands, and other articles of dress.

PATENTS ON WHICH THE STAMP DUTY OF 250 HAS BEEN PAID.

1522 J. H. Johnson 1535 S. Turton 1539 A. B. Brown 1548 A. Moncrieff 1560 W. Lawrence 1567 H. Greaves

1570 A. Grivel 1581 C. H. Murray 1582 H. J. Griswold

1583 D. Cochrane 1726 C. E. Brooman 1736 W. Clark



### NOTICES OF INTENTION TO PROCEED WITH PATENTS.

PAIL	NIS.
From the "London G	azette," June 8, 1869.
229 J. Carr	510 E. Dorsett
282 H. D. Bowyer	519 H. T. and T. Jennings
284 J. and S. Roberts	547 J. and T. Leach and
234 J. and S. Roberts 241 J. Wilson	J. Goodyear
243 W. R. Lake	561 B. W. Farey
251 J. Taylor	566 H. Bessemer
253 H Barcroft	587 E. D. Barker
253 H. Barcroft 255 T. Brown	635 F. N. Gisborne and
266 W. Brown and T. H.	H. Allman
Garbutt	651 W. E. Newton
272 L. P. Hebert and L.	662 T. Forster and R.
A. Moulin	Taylor
273 J. Box	652 R. Wright
274 J. Easterbrook, J.	684 R. R. Bevis
H. Allcard, and A.	699 J. P. Budd
H. Allcard, and A. M. Wild	715 I. Hudson
276 G. Hawksley	727 G. Spencer and J.
277 W. M'Lean	Barker
278 J. Pickering	764 D. S. Price
280 J. M'Donald	799 O. Whittaker and H.
282 G. Hawksley 302 A. S. Andrews	and I. Wallwork
302 A. S. Andrews	814 M. Rourke
305 C. D. Abel	846 S. R. Wybrants
305 C. D. Abel 306 T. G. Daw	900 F. Baker
307 J. A. Limbert 312 A. Barclay	938 G. Bloem and E.
312 A. Barclay	Scheidt
315 D. Joy	1007 R. Allan
317 A. E. Harris	1032 J. Sterriker
318 W. I. Palmer and W.	1044 W. T. Rickard
P. Goulding	1076 J. Aspinall 1078 T. Culpin
324 V. Baker 335 F. Vauderaey 332 C. E. Brooman	1173 L. Eggert and O. E.
332 C. E. Brooman	Pohl
334 W Maddick	1214 M. Andrew
340 H and J Bryceson	1253 W. B. Dick
334 W. Maddick 340 H. and J. Bryceson and T. H. Morten	1341 T. Greenwood
342 J. J. Bagshawe and	1348 G. Ritchie
W. F. Batho	1369 T. Perkins
349 E. Morewood	1369 T. Perkins 1394 I. and G. Battinson
356 W. Blundell	and T. Whitehead
357 J. Page	1418 H. R. Lumley
362 J. Halford	1429 J. Withers
367 C. S. Dawson	1459 J. H. Johnson
368 H. A. Dufrene	1468 T. G. F. Dolby 1488 G. T. Bousfield
J. C. Shaw J. H. Johnson	1488 G. T. Bousfield
J. H. Johnson	1504 D. Hitchen
\$87 W. R. Lake	1510 W. R. Lake
388 B. Hunt	1512 W. R. Lake
412 W. Lever 419 P. Taysen	1546 D. Roberge
ASS W I Horton	1568 G. Johnston
435 W. J. Horton 444 F. C. Hills	1596 G T Ropefield
460 A. H. Lewis	1582 H. R. Lumley 1586 G. T. Bousfield 1625 R. P. Williams
481 J. R. and R. Wood	1647 W. R. Lake
481 J., B., and R. Wood 492 J. Darlington	1682 W. R. Lake
500 T. H. Martin	

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application. of the objection to the application.

#### LIST OF SEALED PATENTS.

3700 E. Francillon	3754 W. Griffiths
3703 D. Thomson	3758 A. Mathiessen
3705 H. Denton	3765 W. Dawes and E. A.
3706 E. K. Dutton	Ramsden
3710 J. Holmes	3766 J. Pickles, E. Rams-
3712 D. H. Paterson	bottom, S. Haggas,
3719 J. Ridley	S. Foulds, J. Shack-
3722 W. R. Lake	leton, and W. Berry
3727 C. Farrar	3768 T. Holder and G.
3728 A. Mackie	Dover
3734 R. B. Roden	3775 J. Millward
3735 T. Speir	3780 Z. Poirier
3736 T. Speir	3828 A. M. Clark
3737 T. Lancaster	3879 R. Wilson
3742 J. and J. Kirk	3917 B. W. Maughan
3746 S. S. Anderson	

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Sonled	Inna	Q	1869

Sealed June	9 8, 1869.
3747 J. T. Parlour	6 T. Green
3755 J. Norman	7 T. Green, W. Bu
3764 J. F. Bentley	rows, and R. Turn
3769 H. Carter and G. H.	9 F. Perry
Edwards	10 M. Henry
3787 G. A. C. Bremme	97 S. Jellyman
3808 W. Bywater	128 S. Sehet
3813 M. Brown-Westhead	188 F. Lipscombe
and R. Smith	236 C. L. Wood and
3821 W. N. Nicholson	Hockley
3838 F. Robert-Theurer	326 J. G. Willans
3848 J. Quick and J.	632 J. G. Willans
Sampson	670 W. E. Gedge
3854 W. F. Thomas	823 J. C. Ramsden
3912 A. Sezille	899 C. B. Parkinson,
3934 C. D. Abel	and J. Metcal!, ar
3952 C. D. Abel	W. H. Heald
3986 H. E. Newton	1117 J. Kirk
3987 W. E. Newton	

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1425	1547	1567	1581	1592	1601	1610	1622
1439	1549	1570	1582	1593	1602	1611	1623
1448	1551	1571	1584	1594	1603	1612	1624
€1513	1553	1574	1585	1595	1604	1613	1625
1517	1555	1575	1586	1596	1605	1614	1626
1539	1559	1576	1587	1597	1606	1615	1627
1541	1561	1577	1588	1598	1607	1618	2021

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1655 J. King and J. Par- 1663 J. Whitworth tington 1684 G. B. Toselli

#### LIST OF SPECIFICATIONS PUBLISHED

For the week ending June 5, 1869.

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_	8.	d.		8.	d		8.	d.			d.		s. d.		8.	d.
3184						3273			3294			3311		3326	0	10
3185	0	8	3240	0	10	3275	0	4	3295	0	4	3312	0 4	3327	0	4
3192	0	10	3243	0	8	3277	0	10	3297	0	6	3313	0 4	3329	0	4
3199	0	10	3254	0	10	3279	0	4	3299	0		3315		3330	0	4
3200	0	8	3257	0	10	3281	0	4	3300	0	8	3317	0 4	3333	0	4
3204	1	0	3261	0	8	3282	1	0	3301	0	10	3319	0 4	3334	0	4
3208	1	4	3267	0	4	3283	1	0	3302	0	4	3320	0 4	3352	0	4
3217	0	6	3268	0	4	3284	0	4	3303	0	4	3321	0 8	3362	0	8
3225	0	8	3269	0	4	3285	0	4	3306	0	10	3322	0 4	3377	1	(
3227	0	6	3270	0	4	3287	0	4	3307	0	4	3323	0 4	3380	0	4
3231	0	10	3271	0	4	3289	0	6	3309	0	4	3324	1 0	3811	0	4
3233	2	6	3272	0	6	3293	0	4								

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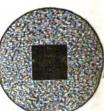
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#### MECHANICS' MAGAZINE.

LONDON: FRIDAY, JUNE 19, 1869.

#### COLLIERY EXPLOSIONS.

THE immediate cause of the recent catastrophe at the Ferndale Colliery has not been the uncertain subject of speculation that such matters so frequently are; it was discovered at an early stage of the search. One of the victims, with that unfortunate disregard of danger to which those who follow highly hazardous occupations are so liable, wished to have a pipe over his work. The pipe, the tobacco box, and the opened lamp, showed that he was bent upon indulging in his wish at all risks. But before his purpose could be accomplished, his foolhardiness had cost him his life, and had sent his fellow workmen by scores into eternity.

And this is no new picture—the same tale has been told many a time and oft before, and may even have to be told again and again. The first thing that naturally occurs to everyone reading a description of the catastrophe is, Why are not miners' lamps provided with such fastenings as that the man cannot open them without destroying or damaging the lamps? We answer that means have been found—and excellent means, too-for securely locking miners' lamps, and for otherwise rendering them safe. There is the lamp of Mr. Story Horn, described and illustrated in the MECHANICS' MAGAZINE for April 9 last, and there is also the safety lamp of Mr. Gray, which appeared in our issue for the 30th of the same month. But. as a means of fastening the lamp safely and securely against the miner, the plan of Mr. S. P. Bidder, jun., described in our last number, must, we think, carry off the palm. Mr. Bidder has a spring bolt in the bottom of the lamp, which, when the bottom is screwed on to the upper part, shoots into a chamber in the upper frame, and the lamp cannot be unscrewed until the bolt is withdrawn. As it is held up by a spring, and as there is no access to it, this would at first appear an impossibility. Not so, however, when a powerful electro-magnet is applied under the lamp, directly beneath the spring. The electro-magnet being kept in the lamp room, and being of too expensive a character to be indulged by the miner, he cannot open his lamp otherwise than at the proper time and place. This method of locking miners' lamps was practically demonstrated at the recent conversazione of the Institution of Civil Engineers, and the principle is being applied to the whole of the lamps at the Harecastle Collieries, in Staffordshire.

Here, then, we appear to have the means of perfect immunity from the fearful explosions which have of late taken place with fatal continuity. But we fear that the most perfect system will not prove a perfect remedy, inasmuch as the man who would open his lamp would not hesitate, when that was utterly closed against him, to use a lucifer match or any other means of obtaining a light. With the devices we have mentioned, a colliery may be comparatively secure, but it cannot be absolutely safe so long as the men show an utter disregard to all rules and an indifference to their own and their comrades' safety. This, then, brings us to look at the other side of the question, and to inquire whether, as prevention is so greatly to be preferred to cure, there is nothing left undone that could be done, which would conduce to the safety of collieries, irrespective of locking safety lamps and other devices. And here we think there is much for which mining engineers must be held respond of the widows and orphans of their late comacter a clear saving of 35min. in time and 5d. in sible. How does it happen that a number of rades. But, no; the only accounts we observe expense; besides which—and this is of the

men are working, probably in fancied security, and then all at once are enveloped in the explosion, as it were, of a powder magazine? Let one of their number answer the question. In a short but highly suggestive letter in the "Times," of Tuesday, Mr. George Fowler, writing from Hucknall Colliery, Notts, observes that the only parts of the mine in which any attempt is now made to ventilate are the working roads and faces; the goaves, or places where the coal has been got, being left to take care of themselves. It thus happens, therefore, if a shot be fired, or any other vibration be imparted to the air, that the highly elastic gas lying in the crevices of the goaf expands, and if a naked light be present, an explosion is the consequence. The same writer asserts that there are many mines in work in which a man dare not for his life's sake carry a naked candle, and challenges a denial of his statement. There are many mines wholly de-pendent for their safety on the lamps and the caution of the men who use them. Unctionably, this is not as it should be. Unquesnormal condition of a mine should be perfect freedom from gas, and until this is brought about there is no reasonable hope of the is wanted, then, is a strong preventive measure in this direction. If there be no accumulation of gas, there can, except in the rare case of "blowers," be no explosion. With these facts staring us in the face, it is time to look to higher intelligence to prevent these disasters by removing from the careless, the ignorant, or the foolbardy, the means whereby they may, however unintentionally, practically commit suicide, and slaughter their fellow creatures by wholesale.

In the meantime, however, and until min-ing engineers have devised means for preventing such a condition of things in the workings, as is represented by Mr. George Fowler, it is still our duty to insist upon the adoption of such preventive measures as are ready to hand. And even under improved systems of working, every precaution will still be necessary, inasmuch as coal mines are worked under conditions which, at the best, will always present features of risk. Hence, the systems of locking the miners' lamps, and of rendering them safe in other respects, to have alluded, will always, and which we under any circumstances, prove of the highest value and importance. Hence, also, stringent supervision should be enforced, and if men will not care for themselves, they should at least be made to feel that there are more lives than their own at stake. But what can the closest supervision effect, or what will the most rigid rules do, in the case of such a class of men as appears to be working at the Fern-dale Colliery? What can be said or done when we find that of those delivered from sudden death, there were none who were sober enough to carry the remains of their late mates to the grave, but that the coffins were borne by strangers? And what, when we find that one of the number who was brought up half dead to the pit's mouth, celebrates his deliverance by a drunken debauch? These are startling statements, but they are, never theless, veritable facts, which, we can only trust, would not find their parallel in any other mining community. It might reasonably have been supposed, that as pay-day followed so closely upon this accident, the men would one and all have devoted somewhat of their earnings to the alleviation of the distress thus suddenly brought upon so many dependent families. We will not go so far as to say that it might have been given as a thank-offering for their own safety, because we fear the majority of these men are hardly capable of realizing such a sentiment as gratitude for such a mercy. But they surely possess some spark of charity, which ought to have prompted them to consider the wants

of them, state that they have given themselves

up to a drunken revelry.

But to return to the practical point at issue —the prevention of these calamities—we will here take the opportunity of noticing another invention having this object. Mr. S. P. Bidder, jun.—the same gentleman to whose method of locking safety lamps we have referred-has invented a machine for breaking down coal without the use of gunpowder. A model of this machine was exhibited at the late conversazione at the Institution of Civil Engineers, and it was briefly referred to in our notice. We have since received the details of the apparatus, and think no time could be more fitting than the present for bringing the invention before the public. Mr. Bidder was led to the present invention by a knowledge of the impossibility of providing, in some cases, a perfect system of ventilation, and the danger of blasting with gunpowder. He, therefore, effects the breaking down of coal with an apparatus of which the following is a description:—There is first a small hydraulic press of 15 tons power, and which weighs about 1 cwt. Connected with the press, by a collar, is a pair of steel tension straps bent in the form of a tuning-fork. At the end of these straps is a clearance box, about 4in. long, and upon each side of the straps are steel expanding pieces, about 15in. in length, and which press against the sides of the hole. In working, the points of a pair of twin wedges, 15in. by 3in., which form one wedge, are inserted in the expanding piece, and the machine is fixed in the hole. The hydraulic press which is charged with about three pints of water, is then worked by a man, by means of a small handle, and the ram from the cylinder is forced out, thus driving up the pair of wedges between the expanding up the pair of wedges between the expanding pieces, giving a lateral extension of about 3in. This not being in all cases sufficient to bring down the coal, the press is withdrawn, and the relief-valve opened, thereby allowing the water to return to the reservoir, so that the same water is used over and over again. A second wedge is then inserted between the two twin wedges, and is driven home in the same way as before. By this means, an additional expansion of 3in. is obtained, making a total expansion of 6in., which, in most cases, is found sufficient. A third wedge can be applied, if necessary, and the expansion thus increased to the extent required.

The principal part of the machine is the drilling apparatus, and this consists of a 11-inch screw 4ft. long, and to the end of which is fixed the drill. A bar of iron is inserted in the coal at the side of the place selected for the hole which the machine has to drill, and this bar serves as a bearing for taking the resistance of the screw. A hole, 10in. deep and 1in. in diameter, is first punched with an ordinary tool, and in it the bar is inserted. The screw is then adjusted to the bar, and the drill driven in the coal by means of a handle at the end of the screw, which is turned by the operator. occupied in cutting the hole for the bar is occupied in cutting the noie for the bar is usually about 4min., and the time required for drilling a hole for the machine, 3ft. 6in. deep and 3in. diameter, is from 10min. to 15min., according to the hardness of the mineral. This apparatus has been practically tried, with highly satisfactory results, at a pit belonging to the North Staffordshire Coal and Iron Company, at [Talk of the Hill in a heading known as the Talk-o'-th'-Hill, in a heading known as the Eight-feet Banbury seam of coal, at a depth of 350 yards from the surface. Notwithstanding the disadvantages under which first trials of machines are usually conducted, the hole for the machine was drilled and about four tons of coal were brought down in 25min. According to the present system of blasting, an hour would have been required to drill a hole and fire a shot, which would take 1lb. of gunpowder, costing 5d. Here, then, we have



first importance—the work was done without the slightest danger. Other trials succeeded the one above recorded, the results being equally satisfactory. Mr. P. Higson, the Government inspector of mines for the district of South-West Lancashire and North Wales, was present at the trials, and we understand he has been instructed to report the result to the Home Secretary. If it can be shown that Mr. Bidder's machine effectually supersedes blasting with gunpowder, the Government will probably prohibit the use of powder in dangerous seams, and thus we shall have advanced one important step in the prevention of colliery explosions.

#### SHELL EXPERIMENTS AT DARTMOOR.

TN the wild and romantic regions of the Dartmoor Forest, Devon, and about a mile from the unromantic prison, a camp of some 300 men has lately been formed. The troops consist of the A battery of the C Brigade of Royal Horse Artillery, with six 9-pounder breech-loading Armstrong guns; the C battery of the 9th brigade of Royal Artillery, with six 12-pounder breech-loading Armstrong guns; and a battery of the 13th brigade of Royal Artillery to assist in placing the targets, throwing up earthworks, &c. This force is under the command of Colonel Saunders, and the object for which they are assembled is to test the relative practical values of shrapnel, segment, and common shells for rifled field artillery service. It has been the endeavour of the authorities to determine this by a series of experiments at Shoeburyness. But the character of the ground, which is a hard, flat, sandy plain, quite unfits it for the purpose, and the results have not been of any practical value. At Dartmoor, we have ground of an irregular and varying nature, presenting points resembling those which would be met with in actual service. Hence, the series of experiments which it is proposed to carry out there will determine what results are likely to be attained by artillery shell practice in hostile engagements. The committee appointed to conduct these experiments consists of Major General Dickson, V.C., C.B. (President), Colonel Elwyn, R.A., commandant and superintendent of experiments at Shoeburyness Colonel Romer, commanding Royal Artillery, Western District; Colonel Strange, C.B., R.H.A., Colonel Michell, C.B., R.H.A., Lieut.-Colonel Sladen, R.H.A., and Major Stirling, R.A. Captain Alderson, R.A., the assistant superintendent of Shoeburyness, is the secretary, and his Shoebury experience will prove invaluable to the committee.

The proceedings commenced on Wednesday last, but the practice was considered as preliminary only. The instructions directed the firing of segment, shrapnel, and common rifle shells over moderately broken ground, each half battery to fire five rounds per gun deliberately, using time and percussion fuzes in segment and common shells. Is is intended, in all experiments where the time and percussion fuzes are used in conjunction with each other, to burst the shell by the time fuze. A double line of targets has been erected at 1,300 yards range; they are 54ft. wide by 6ft. high. The trials commenced by the first half battery (A) of three 9-pounder breech-loading guns, firing segment shells with E time and C percussion fuzes. Five rounds were fired from each gun, the elevations varying from 3deg. 31min. to 3 deg. 10min., and the length of the fuze from 2.23 to 1.95in. The time fuzes were set too long for the range, so most of the shells burst on graze of percussion fuze. In the front row of targets, four segments and splinters went

each gun with common shell and F time and C percussion fuzes. The elevation of the gun was from 3deg. 10min. to 3deg. 12min., the length of the fuze 2.0in. The bursts were two prematures, five in front, from 20 to 75 yards short of targets, and two through. The result was, on the front targets, nine through and one struck; and on the rear targets, ten through and four struck. 'The cause of the premature bursts was too deep a socket in the shell, a little play being allowed for the C percussion fuze, a defect which was afterwards remedied. The second half battery (A) of three 9-pounder breech-loading guns, firing Boxershrapnel shell, with 5sec. wood time fuzes, then took their turn. Fifteen rounds were fired at an elevation of 3deg. 12min. throughout; the fuze, for the first nine rounds, was bored at 0.7in., and for the remainder at 0.65in. The burst was seven in front, varying from 10 to 150 yards short of targets; eight grazed and blind. The effects were, on the front row, 54 bullets and splinters through, four lodged, and nine struck; on the rear row, 50 through, eight lodged, and 21 struck.

The third part of the experiments was carried out by the first half battery of the 12 pounder C battery, which fired Boxershrapnel shells and 5sec. wood time fuzes. Five rounds were fired from each of the three guns at 2deg. 50min. elevation throughout. The fuzes were bored at 0.6in. for the first and last three rounds, the intermediate being at 0.65in. With the 0.6 fuze the bursts all took place at points from 35 to 175 yards in front of the targets. The 0.65 fuze gave as a result one burst just in front of the targets; another, 120 yards to the front, the remainder being beyond the targets. The remainder being beyond the targets. The front row of targets had 69 bullets and splinters through, 10 lodged and nine struck, whilst the rear row had 68 through, 14 lodged, and eight struck. The second half of the same battery (C) then came into play, firing five rounds from each of their three guns, segment shells, with E time and C percussion fuzes, being used. The clevation was from 2deg. 55min. to 2deg. 50min., the fuzes were set to 1.95in., and gradually reduced to 1.7in., their proper length, for the last six rounds. In the first nine rounds, there were three bursts on graze at distances of from five to 40 yards in front of the and six on graze to the rear. The last six rounds all burst by time fuze from 30 to 175 yards in front. The front targets had 24 segments and splinters through, 26 lodged, and 42 struck. In the rear row, nine went through, four lodged, and 14 struck. This concluded the proceedings for the day, which are to be resumed, and we shall place the results before our readers in due course.

#### THE ISTHMUS OF SUEZ COMPANY.

N the execution of any public or private 1 enterprise, the promoters have not only to supply the "sinews of war" and carry on the campaign during the progress of the works, but, in addition, they rarely receive any advantage until the works are completed, and the whole affair placed au courant. interest allowed on all paid-up calls can scarcely be said to come under the head of any distinct commercial advantage or benefit accruing to the shareholders. It is but therefore, that all companies should look a little beyond the mere present, and endeavour to secure for themselves such rights and privileges as may in the end com-pensate them for the risk they undergo, the perseverance they exhibit, and the energy they display. There are so many energetic and enterprising individuals and companies in our own country, that very little difficulty through; one lodged and three struck. On the rear row there were three through, and one large hole caused by a shell bursting close up. Three rounds were then fired from

out works of an industrial and engineering description are comparatively so great in a civilized and highly cultivated country, that the task is not of so serious or arduous a nature as in a land where a railway is unknown, and where an ordinary road is some-thing to be proud of. Hence it is that the inducements held out to capitalists and companies to start railways, roads, tramways, canals, harbours, and other works in comparatively uncivilized and unexplored countries, are of a very high order. They usually include immunity from competition, a grant of—what would be considered by us—an enormous amount of land in the immediate vicinity of the line of project, and the right of valuable productions that may happen to be situated on the land granted. When it is borne in mind that a railway or other extensive artery of national intercommunication is almost invariably the avant courier of pro-sperity, commercial industry, and growth of population, it is no wonder that many such undertakings are carried out more for the sake of the extraneous advantages attached to them, than for the benefit of the actual receipts derived from them when completed. This arrangement is also advantageous to the Government of the country, which always stipulates for the ultimate purchase of the works after the lapse of a certain time, should it desire to do so, as it is thereby enabled to assume the control over them, without at the same time entrenching upon the other rights it has accorded to those who promoted the

project.

Now that the piercing of the Suez Canal is almost a fait accompli, it is only to be expected that the company is somewhat anxious to secure to itself the prospect of an adequate and permanent reward for all that it has gone through. Previously to the recent departure from Egypt of the Viceroy, a new arrange-ment was entered into, which concludes satis-factorily the several items of negociation which had not been definitely settled during the earlier stages of the proceedings. is, the company receives a first indemnity of £1,200,000, and has been accorded permission to sell certain lands in conjunction with the Viceroy as part owner. On its side, the Company, after 1st October next, cedes the privilege it has hitherto enjoyed of importing, free of duty, all materials necessary for the canalization of the isthmus. After that date, not very far distant now, it will come under the ordinary regulations prevailing in the country on everything relating to the importation of foreign materials. An indemnity of £800,000 is allowed to the company as a "set off" against its abandonment of the monopoly of the fresh water canal, which had been formerly granted to it. For the future, its control will be limited altogether to the salt water or maritime canal which, from first to last, was the main object in view. construction of the smaller work was imperative upon the company, as an indispensable preliminary to commencing that gigantic task which has been narrowly and jealously watched during every stage of its progress by the whole of the civilized world. It is unquestionable that many of the lookers on were unwilling witnesses of the well-merited success that has attended the indefatigable exertions of M. Lesseps, and a few of them would probably have rejoiced had the whole project eventuated a failure, were it only to demonstrate the truth of their own ill-omened predictions. Until the small or fresh water canal was manifestly approaching completion, these erroneous prophecies were still persisted in; but the absolute junction of the two seas—the "meeting of the waters"—gave the death blow to the hopes of those who were -gave the

antagonistic to the enterprise.



mutual satisfaction. During its temporary occupation of the site, the company found themselves obliged to erect hospitals, magazines, stores, and buildings, many of which were of a permanent and durable character. Their extent and value may be estimated from the fact that the Viceroy pays the company £400,000 for their becoming his property. This cession includes the extensive magazines of Boulak and Damietta, all the hospitals and buildings attached to them, and the premises and workships established in connection with the quarries and harbour of Mex. It is also stipulated that there shall be an ulterior arrangement respecting the disposition of 25,000 acres at the disposal of the company, and situated along the banks of the maritime canal. The same clause provides for the land that was originally appropriated to the extension of Port Said and Ismailia. The object of all this negociation is evidently the desire on the part of the Egyptian Government to exercise the supreme control over the management of the canal, and thus reserve to itself the right of imposing and levying all dues regulating the export and import duties, and, in fact, opening or closing the canal at its own good pleasure. It is to be hoped that so great and arduous a work will remain ever devoted to the interests of peace, and that its sole mission will be to promote the com-mercial welfare and prosperity of the different nations which may send their vessels through its waters. At the same time, it would be idle to deny the possibility of a hostile gunboat endeavouring to force a passage; and for this reason we sincerely trust the efforts being at present made by the Viceroy to secure to the world at large that the Suez Canal shall be neutral water during war time may be successful. All that is required is the co-operation of the nations of Europe, and the affair is accomplished.

#### SCREW PROPULSION.\*

WE have now come to the last part of Mr. W Burgh's treatise on Modern Screw Propulsion—or, rather, the last part has come This completes a work which abounds in useful information upon a subject of the highest importance in connection with the practice of marine engineering in the present Those who have followed us in our occasional notices of this work will have observed that it contains articles on the various branches of the subject, which have been written by some of our leading marine engineers, who are thoroughly competent to deal with the matter. Thus, we have Mr. Penn supplying information upon lignum vitæ bearings, Messrs. Maudslay upon the practice of feathering screw propellers, and Mr. G. B. Rennie upon screw propulsion generally. Then Mr. Griffiths has explained the principles upon which his screw propeller is founded; Mr. C. Barclay has discussed the geometry of the feathering paddle wheel, and Mr. Langdon has given the proportions for thrust blocks. In another direction, we have Captain T. E. Symonds, R.N., and Messrs. Dudgeon, informing us upon the principles and practice of twin screw propulsion; whilst Mr. Arthur Rigg has detailed his experience with regard to the use of vanes in connection with the screw. Mr. Burgh himself has contributed various articles on the general subject, as well as others on detail principles, so that the result is a collection of valuable facts and figures, which we can well recommend to all who seek reliable information upon the whole subject of screw propulsion. But in taking leave of Mr. Burgh, and while complimenting him upon the value of the information contained in his work, we should be unjust to him and to the public if we failed to record that a large

\* "Modern Screw Propulsion." By N. P. Burgh, Engineer. London: E, and F, N. Spon, 48, Charing Cross.

amount of that information is conveyed in language so obscure, so involved, and frequently so ungrammatical, that its value is greatly reduced. The reader is often obliged to guess what the writer's meaning really is, whilst there are passages which are of very doubtful purpose altogether. These remarks apply to those chapters which have been written by Mr. Burgh himself, and which form a contrast to the plain clear statements of the other contributors. It was once Mr. Burgh's great delight to indulge copiously in Latin phrases, and quotations, and italics about every fifth line or so, bearing evidence of the free use of either the one or the other, or of both. remonstrances on these heads appear to have prevailed with Mr. Burgh, in one respect; he has long discontinued the use of his Latin, but he still adheres to his italics. Now, nothing looks worse in a book, and nothing is more interrupting to a reader, than a constant recurrence of words and phrases in a type different from that of the general body, If Mr. Burgh thinks to strengthen his propositions by thus frequently emphasising his expressions, he is mistaken. His arguments frequently become weakened by the indiscriminate and injudicious use he makes of italics, which are often applied in the most unmeaning manner. They are to the reader like the constant thud of a stump orator's fist on the table. So that here we have two causes operating to detract from the value of a work which otherwise undoubtedly possesses great merit. We trust Mr. Burgh will endeavour in his future productions—for we do not suppose he has done with the pen yet— to avoid these two evils; and by a clearer diction, and a renunciation of italics, will make his writings as perspicacious as are those of his fellow labourers in the field of scientific literature.

#### ELECTRICITY AND TELEGRAPHY.

THE "Hull" steamship, having on board the Black Sea cables, for the Indo-European Telegraph Company, has arrived safely at Gibraltar. The principal cable may be expected to be laid at the end of the month.

The repairs to the "Calcutta" have been completed, and she is now having the Persian Gulf cable, that was taken out of her at Plymouth to allow the ship to be docked, coiled on board again. She may be expected to leave Plymouth in about a fortnight; and the "Tweed," with the other portion of the cable, will leave the Victoria Docks about the same time. The delay unavoidably caused by the accident to the "Calcutta," has this advantage—that the submergence of the cable will take place now in a cooler season of the year than it would have been had the cable expedition left at their appointed time. The operations in connection with the "Calcutta" section of cable have been somewhat difficult and excessively tedious. All the cable that remained in the ship had to be coiled on shore in temporary "coils," erected specially. The seventy miles of cable payed out from her, to lighten the ship after the collision, had to be recovered. The operations in connection with this were carried out under the personal superintend-ence of Mr. F. C. Webb, C.E., and the difficulties attending upon recoiling the seventy miles on board in a proper state may be imagined when it is borne in mind that that length was payed over the ship's side without assistance of machinery,

and when she was drifting at various speeds.

The "Porcupine," surveying ship, has left Woolwich on a dredging and scientific expedition for the West Coast of Iceland, and the investigation will comprise the sounding of the North Atlantic bed, between Cape Clear and the Farce Isles. A novelty in sounding will be introduced in the expedition—the observation of the temperature of the bottom, by means of electricity. This will be done with the aid of Mr. C. W. Siemens' electric resistance thermometer, to which we lately called atten-

pleted at the cable works of Mr. W. T. Henley, is now being shipped on board his ship "La Plats and as the whole of the cable—285 miles—will be soon on board, the ship may be expected to leave in about ten days or a fortnight. The cable is an iron covered cable, containing only one wire, insu-lated with Hooper's material.

The United Kingdom Telegraph Company have

opened their new route to Russia, and it is shortly expected that an additional route will be opened by submarine cable to Russia via Sweden; the present route consists principally of submarine cables, from Newcastle to Denmark, and from Denmark through the Baltic to Liban in Russia.

The new British Indian cable has not yet commenced to be sheathed, but a commencement will be made immediately—probably at the beginning of next week. The directors, however, announce the obtaining of several valuable concessions for extensions to China. The new scheme is to conextensions to China. The new science is to connect the British Indian, by a line of telegraph,
from Bangkok through Siam and Cambodia
to Saigon, and thence to Cape St. James
or Cape Podaran, from which place a submarine
cable will be laid to Hong Kong. The privileges
obtained include exclusive rights from the French authorities at Saigon for forty years, the concession from Siam for ninety years, and the exclusive right of communication through Cambodia. We may, therefore, expect that on the successful com-pletion of the British Indian scheme, active and energetic measures will be undertaken for the furtherance of direct telegraphic communication with

The Anglo-American Telegraph Company have just had their ordinary general meeting, and a dividend was declared, making the total dividend of the year a little over 24 per cent., after placing to the reserve fund the usual amount. The repairs to the 1866 cable, which was interrupted in the course of the year, cost £10,000, and the amount course of the year, cost £10,000, and the amount was not considered excessive, when it was borne in mind that a vessel, with skilled hands, had to be sent over to carry out the repairs. Although it was stated that a ship would be specially maintained at Newfoundland to undertake whatever repairs might be required, nothing yet seems to be done; but it would seem advisable, if every repair is to cost that enormous sum, that some steps, as to efficient maintenance, should be taken. It is thought by the most qualified judges of such It is thought by the most qualified judges of such things the safest and most economical plan, and now more than ever desirable when the cables on that coast are on the increase. The almost immediate submergence of the French Atlantic cable was looked upon favourably, as tending to the increase of business, a result that could only be productive of good to them.

The movements of the French Atlantic cable expedition are most satisfactory; the "William Cory" is on her way to St. Pierre, and the "Chiltern" has left for Brest to lay the shore end. The "Great Eastern" left Sheerness on the 12th, and anchored below the Nore the same day. On the following morning she left for Portland, where she arrived on the afternoon of the 14th. The followarrived of the atternoon of the 14th. The holder ing morning she began taking in coals, and it is anticipated that, accompanied by the "Scanderia," she will leave for Brest on the 20th. A grand féte and great rejoicings are to take place at Brest, on her arrival off there, to celebrate the event of laying a submarine cable from France. From our latest accounts, the electrical tests show that the cable is in a very perfect state.

There is every hope that in a few days the money bill for acquiring the electric telegraphs will be brought into the House of Commons. The various arbitrations have come to an end, and the remaining agreements settled. The greatest delay has been due to the arbitration with Reuter's Telegram Company, a large mass of evidence having to be gone through. The whole of this, however, has been completed, and the umpire has given his award, which amounts to the sum of £726,000, each party having to pay their own costs. This amount is somewhat in excess of that which the Post Office had offered to give. The arbitration with several other companies depended greatly upon the Reuter arbitration; and the announcement has been made of the satisfactory settlement of the claim of the Electric and International Telegraph Company, by far the largest claim of all. The actual sum to be paid for their undertaking is £2,938,000, a deduction of £400,000 having been made for depreciation of plant, repairs, and renewal on.

The Peterhead and Norwegian cable, lately companies have increased greatly in value. It is strongly to be hoped that

the measure will at once be brought forward and passed, for the present state of uncertainty is greatly against telegraphic extension in the United King-

ON RECENT DISCOVERIES IN NOTES SCIENCE AND THEIR PRACTICAL AP-PLICATIONS.

SELF-INFLAMMABLE MIXTURES-EASY PROCESSES FOR THE DETECTION OF SULPHUR AND PHOSPHORUS NEW THERMO-ELECTRIC PILE-WHAT IS THE NA-TURE OF GRAHAM'S COMPOUND OF HYDROGEN AND PALLADIUM?

T may be thought that we have a sufficient number of destructive agents at hand already, and that the worst practical applications of science are made when they are added to. We are somewhat of the same opinion, but our duty to our readers, and to the public in general, obliges us, when we meet with matters of this kind, to give an account of them, satisfied that, after all, publicity is the greatest safeguard against their employment. M. Nickles has just published a paper on Greek fire, in which, of course, Fenian fire comes in for a long notice; and he also describes a novelty to us which, it seems, is known in France as the feu lorrain. This latter compound is certainly far more dangerous than the solution of phosphorus in bisulphide of carbon, which obtained the name of Fenian fire; but, at the same time, it is more difficult to employ, since the ignition is instantaneous and violent. The ingredients of the composition are a solution of phosphorus in bisulphide of carbon and chloride of sulphur. When strong liquor ammonia is added to this mixture, violent chemical action ensues, and sufficient heat is developed to instantly ignite the inflammable ingredients. easy to see how such a mixture could be applied to incendiary purposes. A thin glass bottle containing the ammonia could be placed in a larger containing the inflammable mixture, and then, if this were thrown against any object, sufficient violence to break the ammonia bottle, an explosion and a fire must necessarily ensue An experiment may be made by placing some of the mixture in a porcelain dish, and pouring some ammonia upon it; but the experimenter is recom-mended to fix his ammonia bottle on the end of a long stick, and put a safe distance between himself and his experiment. For the lecture-room, an illustration may be given by introducing a strip of filtering paper soaked in strong ammonia into the mixture by which it is ignited, but the action is not so sudder M. Nickles concludes his paper by nor so violent. showing how this mixture and the Fenian fire should be treated to render them harmless. The simplest means is obviously to add to them a solution of oxide of lead in an alkali, by which the phosphorus and sulphur will be converted into harmless and

uninflammable compounds. Writing of sulphur and phosphorus reminds us of some very simple methods of detecting these substances, both in organic and inorganic com-pounds. If we have, for example, an insoluble powder, supposed to be sulphate of barium, it is only necessary to take a grain or two, place it in a thin test tube, throw in a small fragment of potassium or sodium, shake the tube so as to surround the metal with the powder, and then apply heat. In this case, as, of course, with any other sulphates, reduction quickly takes place, and a layer of red sulphide of potassium will be seen on the sides of the tube. Then, if water and acid be added after the tube has cooled, sulphuretted hydro gen will be evolved; or, if water alone be added. the sulphur will be recognized by the beautiful violet colour produced on the addition of nitroprusside of sodium. Metallic sulphides may be similarly treated, but the author cautions us that in the use of realgar the action is violent, and attended with explosion. Dry organic matters, such as hair, nail, or feathers may be treated in just the same way to show the presence of sulphur; but liquids, such as albumen and saliva, or moist skin, require to be dried and carbonized before the potassium or sodium is added. We may mention here that the process is well adapted for the detection of wool with silk. A few fine cuttings of the material should be introduced into a tube with a fragment of one of the alkaline metals, and heated, as described; and then, if wool be present, the aqueous solution will give the re-action of sulphur with the nitro-prusside. Phos-

phorus is found in a very similar way, magnesium peing employed in place of one of the alkaline metals. The powder experimented with must be perfectly dry, and an excess of fine magnesium filings must be used. The application of a stronger heat is also necessary. In this case, a phosphide of magnesium is formed, and when water is added to the cooled mixture, phosphuretted hydrogen is evolved which is recognized by its peculiar onion-like odour, or, if sufficient phosphorus was present, by the spontaneous inflammability of the gas. A grain or two of brain-matter completely carbonized and heated with magnesium will give distinct evidences of phosphorus. These simple processes, which, we ought to state, have been devised by Dr. Schonn, of Stettin, will be found of great use to chemists from their simplicity, and the rapidity with which the experiments may be made.

A new thermo-electric pile is described by MM. Mure and Clamond, in which galena forms the negative element and iron the positive. galena is cut into bars 40 millimetres long and 8 millimetres thick, and thin sheet iron plates 55 millimetres long and 8 millimetres wide, are con-The inventors arrange a series of these so as to form a hollow cylinder, in which a gas burner is placed. The insulations, we should have said, are made with thin plates of mica. Although with forty of these couples the intensity of one Bunsen's cell is obtained, it is hardly necessary to say that we are a long way from getting the electric equivalent of the heat employed.

Mr. Graham's discovery of the occlusion of gases by metals has attracted much attention in France. and several chemists and physicians have repeated the experiments, and expressed their views on the nature of the union which takes place. jority appear to agree with Mr. Graham in regarding hydrogen as a metal, and consider the combination of hydrogen and palladium as an alloy. Favre, however, has come to another conclusion. He expresses an opinion that a more intimate chemical union takes place, and that a hydride of palladium is formed. This view of the nature of This view of the nature of the compound can hardly have been overlooked by so acute a chemist as Mr. Graham, and that he did not adopt it is conclusive, to our mind, that it is not supported by the facts of the case.

#### PARLIAMENTARY NOTES.

YESTERDAY week, while we were going to press, the question of fortifications, shields, and the Moncrieff gun carriage was mooted in the House of Commons. In opening, Captain F. Beaumont called attention to the expenditure to be incurred in completing our fortifications, so far as it related to the protection of guns by means of shields or the use of the Moncrieff gun carriage, The hon, and gallant member said that 20 years had elapsed since we were called upon to look for something to offer resistance to the increasing power of modern ordnance; he mentioned the appointment of the Iron Plate Committee, which sat from 1861 to 1864; of the special committee, better known as the Gibraltar Shield Committee, which reported in 1868, and of the Select Committee, a committee of scientific officers and others, sitting en permanence, who gave place in 1866 to the Committee on Inventions, now sitting; and he enumerated the experiments made by the Iron Plate Committee. The failure of the Gibraltar shield, constructed on the principle of bolting thicknesses of iron together, led to the appointment of the second committee. In February last, an important experiment was made at Shoebury-Three 5-inch plates sent to be tested were bolted together, 6in. apart, and the spaces between them were filled with asphalte. The shield thus made measured 27in. in thickness, and it was fired at with extremely satisfactory results. Further experiments had confirmed the good opinion formed of this shield, which, in all probability, would form a pattern for the future armour for fortifications. But, although the shields had been satisfactorily proved, the means of defending our guns had been imperfectly tested. The Moncrieff gun carriage, which in form represented a rockinghorse with the gun placed on the tail and a weight botween the fore legs, acted so as to cause the gun to be raised by the recoil of the discharge and a anical contrivance kept the gun under cover until it was lowered to be fired again. The defensive power of this invention had been proved inquiry, he would move that an humble address be

but not its offensive, and he feared the invention had been purchased too hurriedly, for if it realized all that was promised the inventor had been ill paid, and if it fell short of what was promised it had been dearly brought. The Moncrieff system should be tested under circumstances similar to those of war. Let Captain Moncrieff make a gun according to his own views, and the War Office a shield of the most approved construction, and let the two be tried against each other. Besides this. he urged the importance of setting the ingenuity of the country at work by inviting competition in shields, because he did not believe the construction of our fortifications could be proceeded with consistently with prudence on the basis of our present knowledge of the science of armour.

Mr. Cardwell was much obliged to his hon. and gallant friend for having postponed bringing forward this question upon a previous occasion, but hoped he would not expect him to go at length into the subject at midnight, especially as opinion upon scientific subjects would not be highly valued by the House. Still, he must observe that gun carriages and shields were not things which could be contrasted with each other in the way the hon. and gallant member proposed. Mr. Moncrieff's most skilful scheme had been brought before him first by the Ordnance Committee, which had considered it most carefully. It had received the entire approval of the authorities at the Horse Guards, and within the last few days he had laid upon the table the report of the committee appointed by his right hon. friend opposite likewise speaking in the highest terms of the invention. Under these circumstances, it was unnecessary for him to enter further into the subject. He had not the least doubt that the shields would soon be in their places. And when the House voted, as he felt persuaded they would do, the sum awarded to Mr. Moncrieff by Lord Northbrook's Committee, they would have made, he believed, a most satisfactory arrangement.

Sir J. Hay, as chairman of the Iron Plate Committee and of the Gibraltar Shield Committee, confirmed the statement of the Secretary of State for War, that it was impossible to contrast the two subjects of iron shields and the Moncrieff gun, both of which were extremely valuable inventions, and both of which when properly placed would become highly serviceable additions to the defences of the country. The Moncrieff gun had been referred to as a kind of hobbyhorse, and he hoped the hon. member opposite would not attempt to ride that hobbyhorse to death. It would be very useful in its proper place, and he hoped his right hon, friend opposite, and everybody who might follow him in the office of Secretary of State for War, would see that the invention was only applied

to its proper purpose. Last Tuesday ovening, the probable exhaustion of our coal fields, as predicted by Sir W. Armstrong, troubled the House for a while. Mr. Poase opened the question by calling attention to the need of an report from the Royal Commission appointed in 1867 to inquire into the duration of the coal fields. The hon, gentleman said his object was rather to elicit information than to communicate it. At various times the question of the exhaus-tion of our coal fields was brought before the country and that House. Without wishing to go very far back, he might mention the names of Dr. Buckland, Sir W. Armstrong, Mr. Hull, and Professor Jevons, each of whom had called attention to this important subject. Professor Jevons cal-culated the quantity of coal still available at 100,000,000,000 tons, and that if we continued the use of it at our present ratio we should exhaust it in 100 years. In 1866, the present Prime Minister laid great stress upon the enormous value of the national wealth in coal. In 1854 the consumption of the year amounted to 64,000,000 tons. In 1861 it was 81,000,000 tons, and at the present time it was no less than 84,000,000 tons. The honmember for Glamorganshire (Mr. H. Vivian) in June, 1866, introduced the subject to the House in an able and interesting speech. The result of that speech was the appointment of a Royal Commission, consisting of the Duke of Argyll, Sir R. Murchison, Sir W. Armstrong, the hon. members for North Durham and Glamorganshire, Mr. Forster, himself (Mr. Pease) and several other gentlemen. That commission proceeded to investigate the probable quantity of coal contained in the coal fields of the United Kingdom, and the probable consumption of the same. Several subsidiary questions were proposed to this commission, which required a considerable amount of organization, time, ability, and labour to investigate. As that commission had now concluded their presented to Her Majesty, praying that she would be graciously pleased to take such further steps as she may be advised, in order to procure from the Royal Commission on the exhaustion of our coal fields, appointed in July, 1866, a report early a date as the difficult character of their investigation will permit.

In seconding the motion, Mr. H. Vivian described the progress made by the commissioners in their inquiries. He stated that the commission commenced their sittings on July 7, 1866, and, as several points of the utmost difficulty were subjected to the state of the mitted to it, it was considered advisable to delegate to several committees of this commission the investigation of the leading points into which the subject naturally divided itself. The first committee had submitted to it the question as to the possible depths to which our coal mines could be worked. The second committee undertook to inquire into the question whether waste occurred in the consumption of our coal. The third question referred to a committee was whether waste occurred in the working of our coals. The fourth question was whether coal existed under a super-incumbent strata. The fifth was the probable future consumption of coal in this country. Each of these questions had been fully investigated, and all the reports were nearly completed. Sir R. Murchison reported as to the extent of our coal fields that the results of the inquiry were most satisfactory, inasmuch as there was every reason to believe that there was a large amount of good fuel procurable for a very long period, even after the exhaustion of our known coal fields. result of the investigations into the Gloucestershire and Somersetshire coal fields was that not more than one-fortieth of the supply had been exhausted, and he hoped and believed that our other coal fields would prove as valuable. The commission was doing useful work at an annual expense less than a thousandth part of what was every year spent on the army, and it was important that the report should contain, not only the information collected, but well-founded conclusions based on it. He, therefore, protested against undue haste being urged upon the commission. however, highly satisfactory to know that enough had been already ascertained to prove that our coal supply was sufficient to last for many genera-

Mr. Secretary Bruce said that, as the commissioners had been prosecuting their work for three years, it was only natural that a desire should arise on the part of the House and of the public to learn the point at which they had arrived; and the feeling of curiosity which existed upon the subject had fortunately been gratified by the instructive address of the hon, member for Glamorganshire (Mr. H. Vivian). The explanations which the hon gentleman had given showed the vast extent of the inquiries which the commissioners had to institute, and it was impossible that these inquiries, if properly conducted, should not extend over a considerable period of time. He was sure, however, that the labours of the commissioners, when their report was published, would be found to have been worthily bestowed, and that they would throw the most valuable light on a question in which this country was most deeply interested. In the meantime, it was satisfactory to find that there were good grounds for believing that our supply of coals was practically illimitable. But it was, no doubt, also desirable that we should, as far as possible, economize those fields which were more easily accessible, and that we should thus be enabled to meet upon the most favourable terms the competition of foreign manufacturers. He had only to add that he hoped the hon. member for South Durham would not think it necessary, after what had passed in the course of the discussion, to press his resolu-tion upon the House.

The hon, member for South Durham did not appear to think it necessary to press his resolution, which was accordingly withdrawn. It is to be hoped that the commissioners will be allowed ample time to digest the information they have obtained. It is of the greatest importance for the satisfaction of the country and the alleviation of certain unfounded apprehensions, that the real state of the case should be accurately ascertained and deliberately made known.

FROM Peru it is stated that the loading of the guano at the Guanape Islands is going on, and that the commissioners lately sent thither to report upon its quality and other points have returned with the announcement that the greater part of the deposits will compare favourably with those from the Chincha

#### RECENT LAUNCHES.

AST Saturday witnessed the successful launch of a new ironclad for the Turkish Government, from the yard of Messrs. Samuda Brothers, at Poplar. She is called the "Moyini-Zaffer," which means "The aid to victory." Her length is 230ft.; breadth, 35ft.; depth, 27ft. Her burden is 1,400 tons, and her displacement 2,400. Her armament will be four 12-ton rifled guns, placed in a double central battery, so arranged that they can be all fired on one broadside, or can be trained to fire in a line nearly parallel with the ship's course as bow and stern chasers. She was designed by Mr. Mackrow, of the Thames Iron Ship Building Company, and is sister ship to the vessel built by that company for the Turkish Government, and launched two months since. She is intended to run at a very high rate of speed, and if the expectations of her designer and builders be realized, she will be the fastest vessel of her class afloat.

Messra. Day and Co., of the Northam Yard, Southampton, have just built a fine steamship for the Peninsular and Oriental Steam Navigation Company, and which was launched from their yard also on Saturday last. The "Hindostan"—as the vessel is named—is the largest ship ever built in the port of Southampton, and will be the largest of the Peninsular and Oriental Company's steam Her leading dimensions are as follows:-Length between perpendiculars, 349ft. 10in.; length on loadwater line, 344ft. 4in.; length over all, 382ft. 8in.; breadth, moulded, 42ft. 3½in.; depth, 33ft.; tonnage, builders' measurement, 3,086 tons; and she will be fitted with engines of 600-horse power. Below the water-line she is built with the best Staffordshire iron, and steel above. She is fitted with a topgallant forecastle and cut-water, figurehead, iron bowsprit, and elliptical will be bark rigged, with the three lower masts and fore and main yards of iron. Accommodation is to be provided on board for 176 first and 55 second class passengers, and she will have capacity to store 800 tons of coals in her bunkers, and 1,400 tons of cargo in the holds. On the adjoining stocks to those lately occupied by the "Hindostan," another fine iron steamship is fast "Hindostan," another fine iron steamship is fast approaching completion for the Royal Mail Company, to be called the "Nile." This vessel is about 2,700 tons, builders' measurement, length between perpendiculars, 347ft.; breadth of beam, 40ft.; and depth, 33ft. She will carry 8/00 tons of cargo and 1,250 tons of coals, and will have a large amount of accommodation for passengers. The engines for the "Nile," which are of 600-horse power, are also under construction by the same firm. Both also under construction by the same firm. Both the "Hindostan" and the "Nile" have been built from designs by Mr. John Macormac, the naval architect of the "Surat," the "Allemannia," and other steamships, constructed at the Northam Iron Works.

#### EXAMINATIONS IN SCIENCE BY THE SCIENCE AND ART DEPARTMENT.

THE Annual Science Examinations of the Science and Art Department were brought to a close on Saturday, May 29. This was the ninth general examination that has been held since the establishment of the system of aid to instruction in science in 1859. The examinations are superintended by local committees. They were in this way held at 437 centres this year, whilst last year they were only held at 261. At that time there were about 15,000 students under instruction; this year there were 25,000, and the number of papers worked shows a similar increase having risen from 13,112 to 23,997. The number The number of candidates in the various subjects was as follows :-

In geometrical drawing there were 2,547, last In geometrical drawing there were 2,047, last year there were 1,337; in machine drawing 2,997, last year 1,671; in building, construction, and naval architecture 1,993, last year 1,206; in elementary mathematics 2,302, last year 1,390; in higher mathematics 85, last year 33; in theoretical mochanics 631, last year 353; in applied mechanics 284, last year 167; in acoustics, light and head 1,250 lest year 167; in acoustics, applied mechanics 284, last year 167; in acoustics, light, and heat 1,350, last year 769; in magnetism and electricity 2,480, last year 1,038; in inorganic chemistry 2,166, last year 964; in organic chemistry 210, last year 123; in geology 609, last year 309; in mineralogy 67, last year 38; in animal physiology 2,227, last year 1,182; in zoology 303, last year 298; in vegetable anatomy and physiology 144, last year 112; in systematic and economic botany 90, last year 73; in mining 48, last year 41; in metallurgy 120, last year 81; in navigation 303, last year 219; in navigation 303, last year 219; in navigation 303, last year 86; in steam deaths by railways, manner not stated, 465.

148, last year 106; and in physical geography

2,786, last year 1,516.

This is the first examination at which the scholarships of £100 per annum, founded by Mr. Whitworth, have been competed for. There have been about 120 candidates for them, and as soon as the results of all the theoretical examinations have been made known, the practical examination will be proceeded with in the manner detailed in the minute of the Lords of the Committee of Council on Education.

#### THE BRITISH ASSOCIATION.

MEETING of the Council of the British Association was held last Saturday, Sir Roderick Murchison in the chair. It was reported by the general secretary that the following presidents of sections had consented to preside at Exeter meeting, and the following vice-presidents were nominated:—Section A (Mathematical and Physical Science).—President, Professor Sylvester, F.R.S.; vice-presidents, Professor Adams, F.R.S., and Mr. W. R. Grove, Q.C., F.R.S. Section B (Chemical Science).—President, Dr. Debus, F.R.S.; vice-presidents, Professor Odling, F.R.S., and Professor Williamson, F.R.S. Section C (Geology).— President, Professor Harkness, F.R.S.; vice-presidents, Mr. R. Godwin-Austen, F.R.S., and Mr. W. Pengelly, F.R.S. Section D (Biology).—President, Professor Rolleston, F.R.S.; vice-presidents, Mr. C. Spence Bate and Mr. E. B. Tylor. Section E (Geography).—President, Sir Bartle Frere; vice-presidents, Sir George Grey, K.C.B., and Mr. A. G. Findlay, F.R.G.S. Section F (Economic Science and Statistics).—President, the Right Hon. Sir Stafford H. Northcote, M.P.; vice-presidents, Mr. T. D. Acland, M.P., and Colonel Sykes, M.P., F.R.S. Section G (Mechanical Science).—President, Mr. C. W. Siemens, F.R.S.; vice-presidents, Mr. G. P. Bidder, F.R.G.S., and Mr. C. Vignoles, F.R.S. The Mayor of Exeter, Sir Stafford Northcote, and Sir John Bowring were present, and supported the application of the working men for a special lecture during the meeting, which was unanimously agreed to, and, subsequently, Professor W. A. Miller, vice-president and treasurer of the Royal Society, was invited to undertake the duty. This learned professor of chemistry, King's College, London, is well known as an excellent lecturer to large audiences, and is highly distinguished for his recent researches in the chemistry of the sun conjointly with Mr. Huggins, F.R.S. The proposal of the Chamber of Agriculture to hold a meeting jointly with the British Association was referred by the Council to Sir Stafford Northcote, as president of the section in which agricultural subjects are usually discussed.

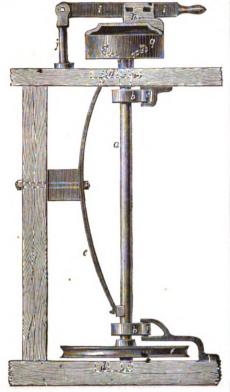
#### CENTENARY OF THE STEAM ENGINE.

I SUPPOSE the engineers of Britain are not forgetting that this is the centenary of the birth of Watt's condensing steam engine. Before 1769 his model room; but in April of that year a patent was granted tor it, and the world first knew of the tender child which brought poverty to its rearers, but which has grown to a wealthy giant in these latter times, and coined and scattered millions over the world. If Watt and his masterpiece deserve the honours that have been poured upon them, then have they a right to some sort of commemorative recognition during this, the hundredth year of the engine's life, and one naturally looks to the profession to take the initiative. We are glad of an excuse for crowning the bust of a poet, or for celebrating the birth of a musi-cian; let us not be backward in honouring the memory cian; let us not be backward in honouring the memory and the works of him who, as Brougham modestly inscribed on Chantrey's statue, enlarged the resources of his country, increased the power of man, and rose to an eminent place among the real benefactors of the world. This year, too, is the fiftieth since the death of Watt. It is also the centenary of the birth of his son, James Watt, the younger, and of many a great man besides. Humboldt, Cuvier, the first Brunel, Wellington, Marshals Soult and Ney, and Sir Thomas Lawrence were all born in 1769. Ark-wright's spinning-ienny patent bears the same date. wright's spinning-jenny patent bears the same date.
Truly, as a commemorative year, 1869 is remarkable.
—"Once-a-Week."



#### MACHINE FOR MANUFACTURING POTTERY.

MR. WILLIAM BOULTON, of Providence Foundry, Burslem, has patented the apparatus shown in the annexed cut, the object of which is to give an eccentric or irregular motion to articles of pottery made by the "jigger" or "whirler." Two oval or irregular cams are fixed on the jigger spindle, and are brought in contact with the friction pulley by a spring, the carrier of the pulley being stationary; the neck and toe blocks of the jigger spindle being made to slide, give a motion to the spindle according to the shape



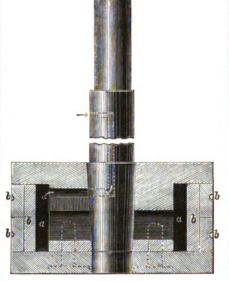
of the pulley. In our cut, which shows a side elevation of the machine, aa is an upright spindle, b b the pulleys or cams on the spindles, c c the friction pulleys, d d the footstep and neck block. e e the spring to keep the two pulleys in point of contact, f f the driving pulley, which is made either flat or grooved, and is to be driven by an endless driving belt; g g is the jigger head on which the dish or other article is made, h the profile to form the same, and i the lever lifting from joint j on which the profile is fixed.

#### PISTON PACKING.

MR. G. E. DONISTHORPE, of Leeds, has patented an improved method of packing pistons. In order to form a steam or fluid-tight packing to a piston or gland, he places around the piston or inside the gland a flexible bag of a ring form. This bag is distended by putting it in connection with a small reservoir containing a fluid which is maintained at a pressure exceeding the working differential pressure of the steam or other fluid with which the engine is worked by means of a piston or plunger forced inwards into it by a weighted lever or by a spring. The action of the lever is so regulated as at all times to be a the lever is so regulated as at all times to be a little above the working pressure in the cylinder at all parts of the stroke, especially when great expansion is adopted. In place of employing a bag, a groove may be formed around the piston or the gland, and this groove may be kept filled with fluid under a pressure greater than the working pressure in the cylinder of the engine. The parts may either be made to fit together sufficiently true to prevent too free an escape of the packing true to prevent too free an escape of the packing or lubricating fluid, or washers or leathers may be placed on either side of the groove to limit the cape of the packing and lubricating fluid. At escape of the packing and lubricating fluid. At the front of the groove around the piston or gland split rings of metal may be placed, so that the rings shall be pressed outwards from the groove by the fluid. These rings will also prevent too free an escape of the fluid from the groove around the piston or gland. The outer diameter of the gland would have to expand, and at the same time

the internal portion would have to contract, to effect a steamtight packing on the piston rod.

When Mr. Donisthorpe employs a bag packing, the bag is formed from two strips of leather, the two ends of each of which are first sewn together to form the strips of leather into rings one larger than the other, and the two rings are then sewn together edge to edge to form an annular bag. Each of the strips of leather from which the bag is made has projecting from one of its sides a short narrow strip, and these short strips are sewn together to form a tube leading into the annular bag. If the bag packing is for a piston, the bag is placed in a groove which is formed around the piston, and in the short tube projecting from the bag is inserted a small brass or copper tube which is passed through or connected with a passage formed through the piston and through the piston rod, and to the end of this pipe or passage is connected a small flexible pipe through which the fluid from a small reservoir under pressure is led into the bag packing. Or the bag packing may be put in connection with a reservoir of fluid under pressure. By this means not only will a sound packing be obtained, but a small quantity of the fluid going through the pores of the leather bag will afford the required amount of lubrication, or the end of the passage through the piston rod may be otherwise put in connection with the small reservoir in which the fluid for expanding the



packing and for lubricating is kept under pressure. The fluid in the reservoir is kept under pressure.

If the lubricating fluid under pressure be alone employed for effecting the packing, Mr. Donisthorpe (for packing a piston) forms the piston to fit very accurately to the cylinder as is now commonly done in the Allen engine, and around the piston are grooves of about in broad, and from the groove a passage is led through the piston and through the piston rod, and through this passage the packthe piston rod, and through this passage the packing fluid under a pressure greater than the working pressure in the cylinder of the engine is led into the grooves around the piston. By reason of the piston fitting very accurately to the cylinder, the too free escape of the fluid from the grooves will be prevented. This arrangement is very applicable in cases where water is employed as the lubricating fluid. As previously observed, washers of leather may be employed on either side of the groove to prevent too free an escape of the lubricating and packing fluid, and split rings of metal may be placed into the groove around the piston. Or it might be a gland, such an arrange-ment being shown in the accompanying cut. The piston is formed in a very similar manner to those in ordinary use, except that the groove a, in which the split rings b b are contained, is by a small passage c through the piston rod put in connection with a small reservoir, in which a lubricating liquid is kept under a pressure greater than the working pressure in the cylinder of the engine.

#### BOILER FLUE CLEANERS.

GOOD and efficient tool for cleaning the flues of A boilers has been the subject of much study on the part of mechanical engineers. The one illus-trated herewith, which we take from the "Scientific American," seems to have many points of excellence, which will become apparent to practical men upon

a description of its structure and operation. The letter A in the engraving indicates a portion of the handle which passes through a ring B, forged with and forming a part of the bar C. The handle A after passing through the ring B, screws firmly into the button D, which is also forged with the bar C and forms a part of it. The point of the bar C ha



a gentle curve toward the longitudinal axis of the a gentle curve toward the longitudinal axis of the handle A, and the other parts of the instrument, and is also tapered and rounded at the point. To the outside of the bar C is riveted the scraper plate E. This scraper plate, when uncoiled, is of rectangular outside of the bar C is riveted the scraper plate E. This scraper plate, when uncoiled, is of rectangular form, having an opening in the centre of the plate, of such shape as would be described by the intersection of two equal circles, the object of which is to multiply the cutting edges of the plate. The plate is bent spirally, so that two points are in line with the bar C, and the rivets which fasten the scraping plate to the bar and the other two points are brought round opposite the bar, as shown in the engraving. The handle may be made of gaspipe, which gives sufficient strength with less weight. The use of the button D is two-fold, i.e., to form an attachment for the handle A, and also to gather the soot and aid in its removal. The scraper plate bent in the form, and attached in the manner described, has great elasticity, and is therefore capable of being inserted readily into flues of different sizes and cleaning them equally well. The curved point of the bar C, in connection with the inclined edges of the scraping plate, compel the contraction of the latter, in entering flues of small size, while the elasticity of the plate forces its cutting edges firmly against the surface of the flues in the process of cleaning. We understand these scrapers have made a very favourable impression where they have been tried. This improvement was patented by Messrs. M. and C. H. Morse, of Franklin, Mass. C. H. Morse, of Franklin, Mass.

#### THE SOCIETY OF ENGINEERS.

WE are informed that the Council of the Society
Of Engineers have decided that the next visit
of their body shall be to the Chatham Dockyard
Extension Works. The Lords Commissioners of the
Admiralty have given their permission, and the
proposition is to make the visit on Friday, July 2,
next. Although the Society visited these works
last year, their importance and the progress made will
doubtless ensure a full attendance upon the occasion.
Moreover, it is proposed to charter a steamboat for
the conveyance of the members from London Bridge
to Chatham, so that the pleasure of the trip will thus the conveyance of the members from London Bridge to Chatham, so that the pleasure of the trip will thus be heightened. In order to allow the Council sufficient time for making the necessary arrangements for the comfort of the members, they should intimate their intention to be present on the occasion to the secretary, Mr. G. W. Harris, at the offices of the Society, 6, Westminster Chambers, Victoria-street. As members and associates may introduce their friends, we may expect the visit to Chatham to be the trip of the season.

#### THE MAURITIUS RAILWAYS-MIDLAND LINE.

By Mr. JAMES R. MOSSE.

BEFORE proceeding to the special object of this communication, which was to give an account of the working of some unusually heavy gradients, the chief physical features of the island, and the causes that led to the introduction of railways in the colony, were briefly noticed. The necessity for railway communication being M. Inst. C.E., was in May, 1858, charged by the Secretary of State for the Colonies to investigate the subject, and having reported in favour of the railway system, the construction of the works was authorized by the Imperial Government in May, 1861. Mr. Hawkshaw (Past President Inst. C.E.), who had previously reported on the railways by order of Government, was appointed consulting engineer, and in September, 1861, a contract was entered into with Messrs. Brassey and Wythes for the execution of the works, which were com-menced early in 1862, under the direction of Mr. Walmsley Stanley, M. Inst. C.E., as chief resident engineer, and of Mr. Longridge, as agent for the contractors. The North line, starting from the central station at Port Louis, traversed northern and north-eastern portions of the island, and was 31 miles in length; while the Midland line, commencing at the same station in Port Louis, passed nearly through the centre of the island, and was 35 miles in length. The only work of importance on these railways was the

\* Read before the Institution of Civil Engineers.



Grand River Viaduct, a description of which had already been given to the Institution (Minutes of Proceedings, Inst. C.E., Vol. XXV., p. 237). The North line was opened for public traffic on May 24, 1864, and the Midland line, on October 19, 1865 Land had been purchased, and all the masonry had been built for two lines of way; but at present the ironwork for the superstructure of the under girder bridges and the permanent way had only been pro-vided for a single line. The total cost of those railways had amounted to £21,876 per mile

The character of the gradients on the Midland line would be understood from the following summary :- From Port Louis to the summit there was a rise of 1,817ft., the distance being about 16 miles, or equal to an average gradient of 1 in 46.68; and from the summit to Mahebourg, a distance of about 19 miles, there was a descent at the rate of 1 in 55.61. For about 12½ miles before reaching the summit the inclination was on an average 1 in 41·17, and thence, for about 13½ miles, the line fell on an average 1 in 45·06. The steepest gradient was 1 in 27, of which there was a total length of 13,526ft., the greatest continuous length of this gradient being 6,163ft., and the next longest 5,016ft The next in severity was 1 in 30, the total length being 9,526ft., the greatest length of this gradient being 3,000ft., and several lengths of about 2,000ft. each. The ascending gradients warled from 1 in 27 to 1 in 60, while the descending gradients, towards Mahebourg, varied from 1 in 30 1 in 60. The curves varied from 950ft. radius to 6,000ft. radius, and the lengths of these curves ranged from 200ft. to 8,200ft. The ordinary radii were generally from 2,000ft. to 3,000ft. The sharpest radius which occurred on the steepest gradients of 1 in 27 and 1 in 30 was 1,600ft.; the greatest continuous length of this curve being 900ft on the former gradient, and 1,930ft on the latter. The next radius in severity was 2,000ft on the maximum gradient of 1 in 27, the greatest continuous length of this curve being 1,000ft. Reverse curves of this radius, 1,920ft. in length, were also found on the maximum inclination of 1 in 27. On descending from the summit to Mahebourg, the line from the 17th mile to the 19th mile might be said to be composed wholly of reverse curves; and at the 29th mile the radius was only 1,400ft., the length of this curve being 1,980ft., chiefly on a gradient of 1 in 30. Of curves under 2,000ft. radius there was an aggregate length of 21,165ft.; of those ranging from 2,000ft. to 4,000ft. radius there was a length of 49,710ft.; and of curves from 4,000ft. to 6,000ft. (the greatest radius), there was an aggregate length of 25,560ft., the total length of curves being 96,435ft., and of the straight portions of the line 89,467ft.

The locomotives furnished under the original

contract for working these inclines were seven in number, and of the following description:—They were tank engines, having cylinders 16in. in diameter, with a length of stroke of 22in.; the wheels, six in number, were 3ft. 6in. in diameter, and were all coupled, the length of the wheel base being 15ft. When supplied with water and fuel, these engines weighed nearly 37 tons, and they were worked with a pressure of steam of 120lb. per square inch. Subsequently, six larger saddle-tank locomotives were designed by Mr. Hawkshaw, having the following dimensions :- Cylinders 18in. in diameter, with a length of stroke of 24in.; the wheels, eight in number, were 4ft. in diameter, and were all coupled, the length of the wheel base and were all coupled, the length of the wheel base being 15ft. 6in. When supplied with water and fuel, these engines weighed nearly 48 tons, and they were worked with a pressure of steam of 120lb, per square inch. The centre pairs of wheels (one of which was the driving pair) were fixed stiff on the frame; but in order to pass easily round the curves, both the leading and the trailing wheels had \$\frac{3}{4}\$in. play on each journal, and the joints of the coupling rods, connecting these wheels with the driving pair, were fitted with a ball and with the driving pair, were fitted with a ball and socket, so as to allow the requisite motion. All the engines were manufactured by Messrs. Sharp, Stewart, and Co., and worked very satisfactorily. These engines would, with passenger trains, take five carriages and one brake-van, equal to a load of 42 tons, though on some occasions they had hauled eight loaded vehicles, weighing in all about 56 tons; while with goods trains the usual load with the lighter locomotives was 70 tons, and with the heavier locomotives from 100 tons to 120 tons. should, however, be stated that by reducing the lead of the slide valves to lin., the power of these engines had recently been increased 10 per cent. The average speed of the passenger trains, including stoppages, was 12 miles per hour between Port Louis and the summit, and 15 miles per hour from Mahebourg to the summit; while that of the goods

trains was about 9 miles an hour, including froquent stoppages. The particulars of a trip made on December 12, 1867, when the fuel and water The particulars of a trip made were noted more accurately than usual, were From these it appeared that the train consisted of ten loaded waggons, weighing together 83 tons, or, with the engine, a gross load of 131 tons; the average speed from Port Louis to the summit was 11 miles per hour, and taking the average pressure of steam in the cylinder as 60lb. square inch, the power exerted would be  $131 \times 60 \times 11 \times 88$ = 230-horse power, or not

88,000 including the weight of the engine 146-horse power, and this divided by the weight of the locomotive was equal to 3.04-horse power per ton of motor. The coal used on the above trip was obtained from Sydney, N.S.W., and the consumption amounted to 4.75lb. per horse power per hour, 8lb. of water being evaporated by 1lb. of coal, but ordinarily only 74lb. of water being evaporated by 1lb. of this coal.

With the exception of the first-class carriages. all the others on this railway had a brake on every wheel, worked from the inside. The ordinary passenger trains were composed of one first, one second, and two third-class carriages, with one brake-van, and to these trains Mr. Clark's continuous brake was attached. This apparatus was worked by a chain, which tightened the brakes on every one of the wheels simultaneously. The brakes were taken off by heavy counterbalance weights, resting longitudinally over the chain in the centre of the carriage, between the front and end wheels. This apparatus was sufficiently powerful to lock every wheel, and had worked satisfactorily; for during two years there had not been a single fracture of the chain, nor of any of the working parts. It, however, required careful management, and must be applied gradually before the train had acquired serious momentum. The brake-van of every passenger train was now provided with sand boxes leading to the rails, as formerly the dew on the rails wetted the wheels of the brake-van, and prevented the friction rollers of the apparatus from revolving; whereas, as soon as sand was applied, the wheels became dry, and the friction rollers acted efficiently. Every train of four or five carriages had two guards, one to work the continuous brake, the other to use the separate brake, if necessary, attached to that carriage which was not connected with the continuous The heaviest passenger train which had descended from the summit to Port Louis consisted of fourteen carriages and two brake-vans, conveying 513 troops. This was on November 14, 1868, and it was kept perfectly under control by the continuous brake on four carriages, and by five additional brakesmen, the speed being steadily maintained at 20 miles per hour. There were but four instances of passenger trains getting for a time beyond control:—First, one morning when the rails were wet, a train descended from the summit for a distance of 33 miles in five minutes, or at a speed of 45 miles per hour. This was the highest speed on record, and it occurred before the sand boxes were put on the brake-vans. Secondly, in a similar way, another train attained a speed of 32 miles per hour. Thirdly, a train over station for a considerable distance, chiefly from the want of sufficient care on the part of the engine-driver and guards. Lastly, a train once attained an excessive speed in descending from the summit, through the dropping off of the nut of the eyebolt passing through the axle on which the continuous chain of the brake apparatus was wound. The speed in descending the inclines was limited theoretically to 18 miles per hour, practically it rarely exceeded 25 miles, and the carriage brakes were generally sufficient to control the train, without the necessity of applying the engine brake. The goods trains in descending the inclines, as a rule, consisted of eight loaded waggons with the lighter locomotives, and of ten or twelve waggons with the heavier engines; and in these cases also the brakes on the waggons, two being screw brakes and the remaining waggons being furnished with the ordinary lever brakes, afforded power sufficient to control the trains. It had long been in contemplation to make safety sidings at the foot of the steepest inclines, but the ground was by no means favourable for the purpose, and, moreover, it was feared that such sidings might become a source of danger.

The rules in force for the regulation of the traffic given in detail, as well as the traffic returns for the years 1866 and 1867, the rates for passengers and goods, and the statement of the receipts an pressure upon the warp beam, by which means, tenon the main line and at the stations were then given in detail, as well as the traffic returns for

expenditure for the year 1866, from which latter it appeared that the working expenses were then 621 per cent. of the receipts; but this result was said to be due to several exceptional causes. sidering the high price paid for skilled labour and for fuel, the agricultural character of the district through which the line passed, the severity of the gradients, the want of anything that could be called a town, save at Port Louis, the lack of minerals or manufactures to transport, the peculiar nature of the sugar traffic—requiring a large amount of rolling stock for three months in the year, whereas, for the remaining nine months less than half the quantity sufficed—the author thought it was not surprising that the working expenses of the Midland line should in 1866 have been 62½ per cent. of the receipts, or 5s. 5d. per train mile. Now that the heavier locomotives enabled a larger amount of sugar to be carried, and when the goods traffic was further developed, it was believed a considerable decrease in the percentage of working expenses to receipts would ensue, accompanied was hoped, by a reduction in the cost per train mile.

In conclusion, it was remarked that, although it might sometimes be impossible to construct a railway with easier gradients than those on the Mid-land line, yet the difficulty of working these inclines in wet weather had been so great, the load hauled so small, and the speed so low, that the author thought the severity of any gradient for a long rise should never exceed 1 in 40; and that it would always be preferable (under the ordinary system of tractive power), to incur, within reasonable limits, any additional expense that might be requisite to bring the inclination within this ratio. requisite to bring the inclination within this ratio. It was also suggested that in laying out such inwhatever might be the ruling gradient (provided it was not entirely exceptional, and where additional power could be applied), that gradient should be followed throughout the line, as far as the features of the country would permit It was likewise recommended that pieces of level should be introduced between the different inclinations, as they were of the greatest value in controlling the trains in descending. The Midland line had now been opened for more than three years, and, fortunately, no accident had yet oc-curred to any train in descending the inclines.

The appendix contained a summary of the gradients and curves, the details of the locomotives and schedule of the rolling stock, the imports and exports in Mauritius from 1860 to 1866, the population, revenue and expenditure of the island, and the immigration returns between the same dates, a memorandum of the steam machinery and of the value of labour and materials in the island, and meteorological observations taken at Port Louis in

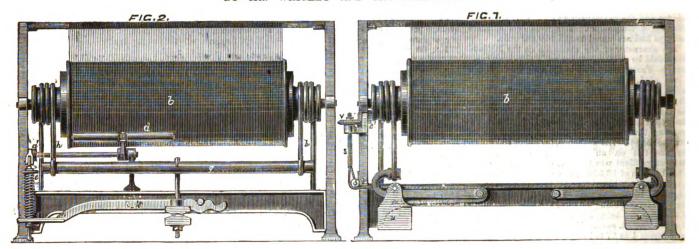
#### ADJUSTING THE TENSION OF WARPS.

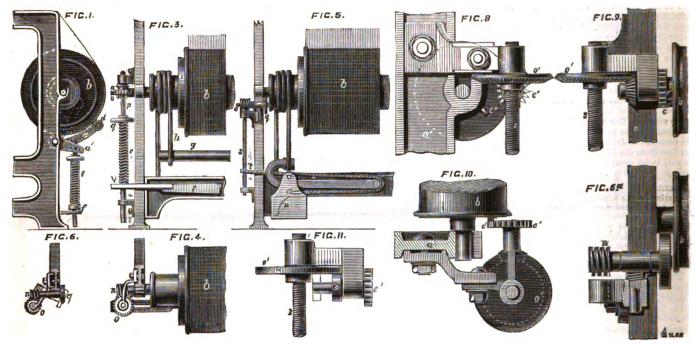
IN weaving, the usual method adopted for adjusting the tension of the I ing the tension of the warps as the warp beam becomes reduced in diameter, is by the opera-tive moving the weights (giving tension to the warps) upon the levers towards the fulera of the same as the yarn is run off the beam. This plan has been improved upon by an invention which has been patented by Mr. Thomas Wrigley, the has been patented by Mr. Thomas Wrigley, the engineer, and Mr. John Richardson, the secretary, of the Loom Improvement Company, Manchester. Their invention is designed for the purpose of regulating and maintaining at one uniform tension, the warp threads of looms as they are delivered from the warp-beam, by self-acting means. This regulating motion may be accomplished by several equivalents, according to the class or style of loom for which it may be required. We will, therefore, proceed to describe the various arrangements and adaptations of mechanism for which these motions are designed.

Figs. 1 and 2 of our engraving represent respectively a side and back elevation of one arrangement of self-regulating mechanism adapted to a loom supplied with a spring and lever motion employed for giving tension to the warps. In these views, a a 1 is a double lever, supported by and having their fulcra in the loom framing a little below the bearing of the warp beam b; the long lever or arm a of this double lever is provided with a flat presser or roller d, which is bedded against and kept in contact with the warp threads upon the beam b through the medium of the spring e, which is connected with the short lever or arm a ! of the double lever, the lower end of the spring being in torrible contact with the lever f, through the medium of

#### ADJUSTING THE TENSION ARRANGEMENTS FOR OF WARPS.

BY MR. WRIGLEY AND MR. RICHARDSON.





sion is given to the warp threads. It will be seen on reference to figs. 1 and 2, that when the warp beam b is full and at its greatest diameter, the spring e is at its greatest compression, thereby spring e is at its greatest compression, thereby exerting its maximum pressure upon the apparatus, giving tension to the warps at the time the warp beam is at its greatest diameter. Now, as the warp beam b delivers its yarn, it gradually becomes reduced in diameter, which being followed by the roller or presser d to its smallest diameter, shown in dots, figs. 1, gives a compensating reduction (through the medium of the double lever c) to the pressure exerted by the spring transmitting tenpressure exerted by the spring transmitting tension to the warps. Thus it will be seen that the pressure of the spring e is gradually reduced in proportion as the warp beam grows less during the time it is delivering its yarn, thereby maintaining throughout from the greatest to the smallest diameter of the warp beam one uniform and even tension.

Figs. 3 and 4 represent a detached back elevation and plan view of another modification of apparatus for effecting through the spring and lever a uniform tension to the warps. In these views, the end of the shaft supporting the warp beam b is provided with a worm n, and gears into a worm wheel o, the boss of which forms a nut that actuates through the medium of a hyperbolic property of the state of the sta thread upon the spindle p, a gradual extension between the surfaces q, and v confining the spring e, and through which tension is transmitted to the warp beam. In this arrangement, when the warp beam is full, the spring e is at its greatest com-pression, so that the slow revolution of the beam as it delivers its yarn transmits motion through

the worm n to the wheel o, whilst revolving on the thread of the spindle p, raises it so as to extend the surfaces between which the spring e is confined, thereby gradually reducing the pressure upon the beam as it delivers its yarn.

Figs. 5 and 6 represent a back elevation and plan view of a self-regulating motion applied to looms, for adjusting and moving the ordinary weight upon the levers, giving tension to the warps in accordance with the delivery of yarn from the beam. In these figs., q is a friction wheel, which is kept in contact with the shaft of the warp beam through the medium of the spring r. This wheel q, as the shaft of the beam revolves, gives motion to the worm n and worm wheel o, which being keyed to the vertical shaft s, causes the shaft as it slowly revolves to coil or wind upon it the cord t, which being connected to the weights u gradually draws or moves them nearer to the fulcrums of their respective levers, in proportion as the yarn is delivered from the beam, thereby uniformly main-taining the tension of the yarn. This arrangement taining the tension of the yarn. This arrangement is shown enlarged at fig. 6°. The friction wheel q, when in its place, and driven by the shaft of the warp beam, is locked by reason of the square head of the swivel stud encircled by the spring r being pressed into the socket, in which, when raised, the bracket supporting the friction wheel is allowed to swivel or turn, as seen in dots, fig. 6, in which position it is removed out of contact with the shaft of the beam, and in which position also the worm n is removed out of gear with the driven worm wheel o, or the square head of the swivel stud may be formed on the lower portion, which allows it, when the friction wheel is in contact with the beam shaft, to be raised by the spring so as to be locked. By this arrangement, the operative depressing the friction wheel would be enabled to swivel or turn the wheel out of gear, and also out of contact with the beam shaft.

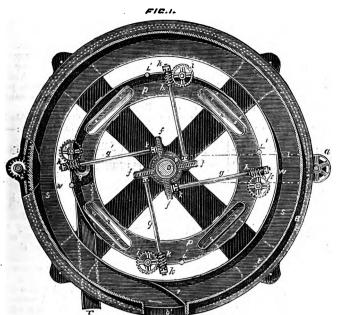
In fig. 7, an intermittent arrangement of driving is shown for moving the weight for regulating the tension of the warps. Bevel gearing v is employed in lieu of worm and wheel. The shaft s transmitting the sliding motion to the weight, in this instance, is caused to rise by reason of a screw in the wheel v, the action of which draws the cord t along wheel v, the action of which draws the cord t along with it, thereby giving the required sliding motion to the weights u u, the effect of which regulates the tension of the warps, as described.

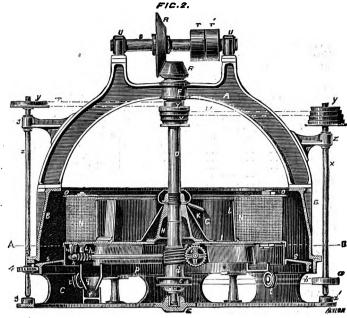
Figs. 8, 9, and 10 represent respectively side, back, and plan views of a self-acting regulating motion, which may be applied for easing the spring e for explicit the tension, or it may be explosed for

which may be applied for easing the spring e for regulating the tension; or it may be employed for actuating the ordinary weights for the purposes described. In these figs.,  $a^1$  is the framing of the loom, b the beam in which a stud or projecting pin  $c^1$  is placed. This stud with every revolution of the beam as the yarn is delivered, comes into goar with one of the teeth in the star wheel  $e^1$ . This wheel, as it is thus caused intermittently to revolve gives motion to the beau wheels  $e^1$  the to revolve, gives motion to the bevel wheels o 1, the revolution of which may be arranged so as to release the pressure of a spring, giving tension to the yarns, or they may be employed for raising a vertical shaft connected to cords, giving motion to the weights, also regulating the tension. The motions so transmitted, whether for releasing the pressure of a spring or removing weights, will regulate the tension of the warps in accordance

#### IMPROVED CENTRIFUGAL MACHINE.

BY MR. J. F. BRINJES.





with the delivery of yarn from the warp beam. Fig. 11 represents an arrangement of adjustable friction gearing to be employed for driving the vertical shaft s.

#### IMPROVED CENTRIFUGAL MACHINE.

THE accompanying engraving illustrates some substantial improvements in centrifugal machines, which have recently been patented by Mr.

J. F. Brinjes, of Fieldgate-street, Whitechapel.

His aim is to enable these machines to be worked continuously, or without stoppages for the intro-duction of the substances to be operated upon, and for their subsequent discharge. By this means, considerable economy in time is effected, and the great wear and tear hitherto attendant upon the frequent stoppage of the machine is prevented.

Another great advantage afforded by these improvements is the continuous self-cleansing by eentrifugal action of the wire gauze or perforated metal forming the straining medium of the drum, without the necessity for using water or steam

without the necessity for using water or steam jets, brushes, or other appliances.

In our engraving, fig. 1 represents a sectional plan of one form of the improved centrifugal machine as adapted for use in the manufacture of sugar, the section being taken along the line A of in fig. 2; fig. 2 is a sectional elevation of the same machine. A is the main framing, resting upon the circular casing B, which is bolted down upon the bed or foundation plate C. D is the main vertical shaft working at its lower end in the footvertical shaft working at its lower end in the footstep bearing E in the base plate, and, at its upper end, in a collar bearing F in the main framing A. This shaft carries the revolving drum G, which is secured to it by the cast-iron boss H bolted to the bottom plate I of the drum, a sheet metal cone K being fitted around the boss for the purpose of deflecting outwards the sugar as fed into the centre of the drum. Near the circumference of the plate I which forms the lower portion of the drum, there are fitted an even number of upright spindles L. L. 1, carrying rollers or pulleys M. M. 1, over which are stretched the endless wire cloths N. N. which constitute the perforated walls or sides of the drum.

the drum.

One of the rollers marked M in each pair serves as the actuating or driving roller of the endless cloth which passes partly round it, whilst the other roller (marked M 1) acts simply as a carrying roller, and may revolve loose on its spindle. Each driving roller M is fast on its spindle L, which rotates on its own axis during the revolutions of the drum. The upper ends of the several spindles L L 1 pass through the top annular plate O of the drum, which plate is bolted down on to upright standards or brackets P of the desired height, the brackets being secured to the lower plate I of the drum. A sufficient space or opening Q is left between the contiguous rollers M M 1 of each adjoining pair for the discharge of the sugar as fast joining pair for the discharge of the sugar as fast as the syrup or liquid has been expelled therefrom

through the straining material, the discharge and supply both taking place continuously during the revolutions of the drum, and hence stoppages are obviated.

The main vertical shaft which carries the drum is actuated by the bevel frictional goar R and driving shaft S, provided with fast and loose driving pulleys T T <sup>1</sup>, and working in the bearings U U cast pulleys T T  $^1$ , and working in the bearings U U cast on the main framing A. Just below the collar bearing of the upright shaft there is keyed the coned driving pulley V, from which a strap W transmits a slower motion to the vertical shaft X through the reversed cone pulley Y fast on the upper end of it. This shaft X works in the collar and footstep bearings Z Z  $^1$ , and carries at its lower extremity the driving pulley a, which, by means of the belt b and pulley c, imparts rotatory motion to the short tubular shaft or collar d which turns freely round and upon the lower end of the main vertical shaft D, but at a slower rate than the restrict young and upon the lower end of the main shaft. D, but at a slower rate than the main shaft. This collar d has a worm or endless screw e formed thereon, which gears into the worm wheels f f fast on the inner ends of the horiwheels f f last on the inner ends of the last containing the spindles g g for driving or actuating the spindles L L of the rollers or pulleys M M which actuate the endless wire cloths. For this purpose, an endless worm h is fitted to the outer end of each of the horizontal spindles g, these worms gearing into worm wheels i i keyed on to the lower extremities of the spindles L L of the driving rollers M M, and thereby imparting a slow rotatory motion thereby, and causing the endless wire cloths to travel slowly round their rollers during the revolutions of the drum G. k k are bracket bearings for carrying the horizontal spindles g g, these bearings being secured to the under side of the bottom plate I of the drum and revolving with it. l lare a series of radial guiding channels (one for each endless travelling wire cloth), the sides being secured to the bottom plate of the drum, and so disposed and contracted at their outer ends as to guide the sugar to be operated upon against the rear end of each of the travelling wire cloths which, when the drum is revolving, travel in the direction shown by the arrows, and carry slowly along with them the sugar until it arrives at the

openings Q Q, through which it is discharged.

During the time occupied by the sugar in travelling from one roller M to the other roller M 1 of communicates with an annular reservoir 9, from the endless wire cloth, the syrup or other liquid is being expelled therefrom through the wirework by the centrifugal action of the drum. By varying the speed of the travelling motion of the wire cloths, the sugar may be submitted to the centrifugal action of the drum for a greater or less period according to requirement. This adjustment or regulation of the speed of travel of the endless wire cloths is effected simply by changing the driving strap or belt W from one sized pulley to another, by which means the speed of the main driving worm e is varied, and a corresponding motion of the endless wire cloths. The syrup which is expelled through the inner half 1 of the \$\mathbb{X}\$?26,000, the company to pay its own costs.

cloths is directed against a inclined plate m, which is fixed between the rollers M M <sup>1</sup> of each pair of rollers, and between the inner half 1 and outer half 2 of the endless wire gauze cloth N.

Whilst the inner portion 1 of the wire gauze is perating as a straining medium, the outer portion 2, which is travelling of course in the opposite direction to the inner portion 1, is being cleansed by the action of the centrifugal force alone, which readily expels or removes any solid substance which may be adhering to the gauze. This operation is greatly assisted by the fact that the position of this part of the gauze is reversed, that surface which was previously next to the interior of the which was previously next to the interior of the drum being now on the exterior, and, consequently, the adhering matter, in lieu of requiring to be forced through the gauze, is removed from the same side of the gauze as that by which it entered.

n n are vertical spouts, connected with suitable apertures o o made in the bottom plate I of the drum, for the purpose of directing the separated liquid into any convenient receptacle. Mr. Brinjes prefers, however to collect such liquid in an inquid into any convenient receptacie. In Finnes prefers, however, to collect such liquid in an annular trough p, the bottom of which is inclined, and has a discharge opening q at its lowest part, which allows the liquid to flow out into an inclined trough r which conveys it away to any desired locality. The sugar, on being discharged through the openings Q Q, is received on a revolving annular table s, supported upon grooved antifriction rollers t carried by studs bolted to the side of the base plate C. w is an annular guard plate attached to the inner circumference of the revolving table s for the purpose of preventing the sugar from gaining access to the driving gear underneath the bottom of the drum.

A rotatory motion is imparted to the annular table s by means of the strap w, pulleys y y, and vertical shaft z, which latter works in the bearings vertical shaft z, which latter works in the bearings 3 3, and carries a spur pinion 4 gearing into corresponding teeth 5 formed on the outer periphery of the annular table. A discharge opening  $b^1$  is made partly in the casing B and partly in the base C, through which the sugar carried round on the table s is directed by means of the fixed inclined guiding plate 7. A pipe and stop cock serves to supply liquor or water as may be required; it communicates with an annular reservoir 9, from which reducts pipe 10 provided with perfected



ON THE SUBMERSION AND RECOVERY OF SUBMARINE CABLES.\*

BY PROFESSOR FLEEMING JENKIN, F.R.S.

THE speaker began by stating that his object was to explain the principles on which engineers had acted in laying and recovering sub-marine cables, rather than to exhibit the details of the machinery employed. The general construc-tion of electrical cables was first described, and specimens were shown; especial attention being drawn to the deep sea French Atlantic cable, consisting of the following parts:—A copper conduc-tor, gutta-percha insulator, and jute serving, surrounded by ten wires of homogeneous iron, each served with five Manilla yarns saturated with tar.

TABLE L.—CONSTRUCTION OF FRENCE ATLANTIC

Breaking Strain.—lbs 644

Strength in tons ... ... 7% tons.

Table No. 1 gives the dimensions, weights, and strengths of each of the component parts. The wire served with hemp will bear a greater weight wire served with hemp will bear a greater weight than the sum of the weights borne separately by the wire and the strands; and, again, the ten served wires, when formed into a rope, bear a greater weight than the sum of the weights which each will bear. Moreover, while the homogeneous from elongates less than 1 per cent. before breaking, and the hemp elongates only 0.75 per cent., the two combined stretch 3 per cent. This paradoxical result is due to want of absolute uniformity in the strength of each part; when separate, each breaks at the weakest point; when combined, the weakest points seldom coincide; hence, the strength of the combination is the sum of the mean strengths of the parts, necessarily greater than the sum of the minimum strengths. The so-called spiral or helical form does not really render the cable elastic or liable to stretch, nor does it compress the core inside the sheathing, as was shown by an experi-ment where the core was actually withdrawn without causing the collapse of the sheathing.

The manner of coiling the cable on board ship was explained by diagrams and models; it being shown that, in order to avoid putting a twist into the rope when taking it out of the hold, it was necessary to put a twist in when coiling it away. Bad coiling produces kinks or loops drawn tight, which are avoided by a cone filling the eye of the coil, and by rings or equivalent arrangements preventing the bight as drawn out of the hold from lashing out under the influence of centrifugal

The following table gives the dimensions and contents of the "Great Eastern" tanks as arranged for the Atlantic expedition. These tanks keep the cable under water on board ship to facilitate the electrical tests. They carry a weight of 5,000 tons in a bulk of 180,000 cubic feet, the tanks not being in a bulk or 100,000 filled quite to the top. TABLE II.

size, these tanks occupy a very insignificant proportion of the whole bulk of the "Great Eastern."

Mr. C. W. Siemens has for light cables employed a sort of reel or drum on a turntable with partial success, instead of the fixed tank and coil. From the tank, the cable, when paid out, passes over a pulley and along a trough to the brake drum, the object of which is to restrain the free exit of the cable to such an extent as is desired. The cable is laid hold of by being passed several times round a drum, as a rope making fast a vessel may be seen to be passed round a bollard; the friction allows a slight strain at one end to prevent a very heavy pull at the other end from causing the rope to slip round the drum. The slight pull at what may be called the light end of the rope is given by a series of jockey pulleys which play the part of the hand when the rope is allowed to slip round a bollard, but, in paying out a cable, the rope does not slip

round a drum; the drum itself turns round restrained by a friction band or belt.

It is essential that this restraining friction should be constant—a result obtained by the Appold brake, which was explained by models and diagrams. In this arrangement both ends of the

 $P = \omega \cos \phi$ ; perpendicularly to itself, where v is the velocity of the ship.

hence, 
$$\cos \phi = \frac{v_{11}^2}{v_1^2} = \frac{v^2 \sin^2 \phi}{v_{12}^2},$$
and  $v_1 = \frac{v \sin \phi}{V \cos \phi};$ ...... 1deg.

and, assuming that the resistance is preportional to the square of the velocity, we have  $\omega = q v_1$ and hence.

$$\frac{\omega}{q} = \frac{v^2 \sin^2 \phi}{\cos \phi}, \text{ or }$$

$$\frac{\omega}{q v^2} = \frac{\cos \phi}{\sin^2 \phi},$$

from which we have

$$\cos \phi = \frac{\sqrt{\omega^2 + 4 m^2} - \omega}{2 m} \dots 2 \deg$$

where  $m = q v^2$ .

was going at the speed of six knots per hour, lay at an angle of 6 deg., so that the inclined plane was seventeen miles long, and each foot of the cable took nearly three hours to reach the bottom

The strain T at the top of the inclined plane, if there were no friction preventing the rope from slipping back along the plane, would be equal to the weight of a piece of cable hanging plumb from

where w is the weight per foot run of the cable and w is the depth in feet.

brake strap are attached to one lever, in such a manner that when the drum begins to turn it tends to lift the lever and weight hanging to it, and as the lever is lifted it slackens the brake strap until the difference of tension on the two ends of the strap is equal to the weight hanging on the lever. When this is the case, the lever is no longer lifted but remains stationary with the strap, allowing the drum to turn, restrained by a con-stant fraction equal to the weight on the lever. If the coefficient of friction increases, the lever will be a little more lifted and the strap slackened; if the coefficient of friction diminishes, the lever and weight will fall, tightening the strap; but in any case the retarding force will be simply equal to the weight.

From the brake drum the rope dips under

a weighted pulley, which rides as it were suspended on a V of taut cable; if the strain increases, the rope straightens and raises the pulley. if the strain diminishes, the weight and pulley fall; thus the height of the pulley indicates the strain. This instrument is called the dynamometer. Lastly, the rope passes over a pulley into

Having shown how the cable was treated, the speaker proceeded to show how the strains to be expected could be calculated. A cable paid out in air hangs in a catenarian curve, but in water lies in a straight line, and the strains in the two cases are wholly different. In air, the rope meets with no sensible obstacle to its motion, either longitudinally or in a direction perpendicular to its own length; in water, on the contrary, each foot of a cable meets with an opposition to its motion perpendicular to its length, which we may call q, and for the Atlantic cable

q = 0.154 v 2. where v is the velocity of the cable normally to its own length in feet per second. Thus, as the cable weighs 0.2575lb. per foot, it cannot sink faster

weighs 0.25751b. per foot, it cannot sink faster than the speed given by the equation
0.2575 = 0.154 v 1²,
from which v 1, the settling velocity, is found to be
1.294ft. per second, or 0.765 knot per hour. The result of this resistance to displacement is that the cable lies in a straight line, not in a catenary curre, supported, as it were, by an inclined plane of water constantly yielding at the velocity v<sub>1</sub>. The inclination of the straight line depends on the velocity of the ship and on  $v_1$  not being at all

affected by the tension of the rope.

The angle  $\phi$  at which the cable will lie may be calculated as follows :- Let P be the resistance of the water to displacement by each foot of the cable of the weight  $\omega$  when lying at the angle  $\phi$ ,

let  $v_{11}$  be the velocity at which the cable moves

 $v_{11} = v \sin \phi$ 

Also 
$$P = \omega \frac{v_{11}^2}{v_{12}^2};$$
hence,  $\cos \phi = \frac{v_{11}^2}{v_{12}^2} = \frac{v^2 \sin^2 \phi}{v_{12}^2},$ 

cos. 
$$\phi = \frac{\sqrt{\omega^2 + 4 m^2} - \omega}{2 det}$$

From this formula, as indeed from common sense, it appears that the greater the value of q and of v the smaller the inclination with the horizon. The rough Atlantic cable when the ship

the surface of the water to the bottom, or  $T = \omega \sigma$ 

But there is a sensible friction which helps to relieve the strain precisely as when a chain is lying on a solid inclined plane; calling  $m_1$  the colying on a solid inclined plane; calling  $m_1$  the coefficient of friction in pounds per foot length of cable at the velocity v in feet per second, and assuming that  $m_1 = q_1 v^2$ , the experiment of the Atlantic cable showed that  $q_1 = .00504$  (this is equivalent to 0.81 cwt. per knot of cable when slack is paid out at the rate of one knot per hour). The result is, that when slack is paid out, say at the rate of one knot per hour, and when  $\phi =$  6.45deg., the strain is diminished by one-half, and if slack were paid out at the rate of 1.4 knot per and when  $\phi =$ 

require no retarding force whatever.

The strain T 1, when the velocity of the cable is v 111, can be found from the following formula:

T<sub>1</sub> = 
$$\omega s - m_1 \frac{\left(\frac{v_{11}}{v} - \cos \phi\right)^s}{\sin \phi}$$
 sin. 8deg.

Cables of light specific gravity have a small settling velocity and lie at great length in the water, and, if they are also rough, the coefficient water, and, it they are also rough, the coefficient q 1 may easily be so great as to relieve the brake of most of the strain which would be necessary to lay a cable of equal weight but small bulk and smoother surface, with the same amount of slack. If no slack were laid, there would be little difference between the tension required for cables of different construction but of equal weights in water. When much slack is laid, all cables will water. When much slack is laid, all cables wur be considerably less strained than if laid without slack; and, finally, the faster the ship goes the less slack is required to produce any given amount of relief.

The correctness of the above theory has been amply proved in practice. If in seas 2 miles deep the cable hung in a catenary 12\frac{3}{2} miles long, the weight to be carried would be  $8\frac{1}{2}$  tons, and the strain on the cable 29 tons; while, if the cable hung in a catenary, the inclination of which to the horizon at the stern was 9deg. 30min., the length would be 24 miles, the weight 17 tons, and the strain 102 tons instead of about 14cwt.—the strain actually observed for the Atlantic cable when being paid out at 7 knots per hour while the ship was going at 6 knots per hour. The rise and fail of the ship, even in heavy weather, very alightly affects the strain while paying out, on account of the slight inclination of the cable to the horizon. The margin of strength in deep sea cables of the Atlantic type is even greater than is given in most engineering works, since the cable will bear tenfold the strain which is found necessary in lay-

tenfold the strain which is found necessary in laying.

The process of grappling was next described, and the operation illustrated, by dragging a ministur grapnel over the floor, so as to hook a chain lyin, there. When the cable is hooked, the strains o the grapnel rope are simply the weights of the bight lifted, and the length of this bight depends on the slack. Thus, with 14 per cent of slack, the length of the cable lifted will be 4.89 times the depth to which it is raised. Thus, in two miles of water, about 9.8 miles of cable will be lifted, the weight on the grapnel will be 6.86 tons, but the strain on the cable will be only one component of this weight resolved in the direction of the tangent to the curve at the grapnel; this strain will be 5.5 to the curve at the grapnel; this strain will be 5.5 tons. Thus, it is clear, that in calm weather, with 14 per cent. slack, the cable can be lifted from a depth of two miles. This was actually done upon one occasion; but owing to pitching of the ship the cable parted, and was successfully recovered by the obvious device of grappling the cable in two points about 24 knots apart, and breaking the cable at the point furthest from land; the loose end then hung down over the other grapnel, and it is obvious that by this plan the strain on any cable in any depth can be limited to the simple weight of a length of cable hanging from the surface to the bottom. The Atlantic cables will bear five times the strain due in this manner to two miles of depth, and for this operation the margin of strength is also ample. The cable is hauled in by machinery very similar to that adopted for paying out; the drum being simply turned in the opposite direction by a steam engine, if only a small length is to be picked up. If many miles are required, the cable is transferred to the bow, and hauled up by a double drum to avoid the fleeting necessity on a single drum. The friction on the water during the opera-tion, adds to the strain; thus, with the valve of q 1 previously found, at one mile per hour, the friction per mile would be 0.81 cwt., adding in a depth of two miles 1.61cwt. to the strain due to the simple weight; besides this, there is some resistance due to the displacement of the water, by the hight of drum. The friction on the water during the opera-

\* Read before the Royal Institution.

the rope at the bottom, and some extra weight due to the fact, that the cable hangs in a catenary, not in a straight line. The length of this catenary depends on the rate at which this cable is hauled through the water; but even after allowing for all these things, the strength of the cable is from three to four times greater than the strain which in fair weather need come on the cable when being picked up from a depth of two miles-a margin of strength not unfrequently adopted even in permanent engineering works.

It was by calculations like these, that before the It was by calculations like these, that before the 1865 cable had been recovered in 1866, the speaker was able to write in "The Times," of August, 1865, "If the cable retain its strength, as it probably will, it can certainly be raised;" and now that experience has confirmed theory, engineers are justified in looking forward with great confidence to the continued prosperity and extension of deep-sea telegraphy. The following tables give some further information as to the French Atlantic cable about to be laid, which will cover fifty acres of ground, being be laid, which will cover fifty acres of ground, being De laid, which will cover hity acres of ground, being a narrow strip, 3,564 knots long, and a little more than an inch wide.

TABLE III.—LENGTHS AND WEIGHTS OF MATERIALS USED IN FRENCH ATLANTIC CABLE.

Knots. Tons.
Copper wire 24,948 538
Gutta-percha 3,564 549
Jute serving 500
Homo. wire 27,222 1,872
Iron wire 9.941 2,855
Total iron and homo, wires 37,163 4,727
Manilla strands
Olark's compound 881 652
Deep-sea cable 2,643 4,366
Shallow-water cable 3,881
Total cable 3,564 8,247
TABLE IV.—LENGTHS OF EXISTING CABLES.
Knots.
Atlantic (two) 3,748
Malta, Alexandria (two)
Persian Gulf
Home seas
Miscellaneous (approximate) 1,350
minocinamous (approximate)
Total 9.937

#### THE CHANNEL RAILWAY BRIDGE.

THE CHANNEL RAILWAY BRIDGE.

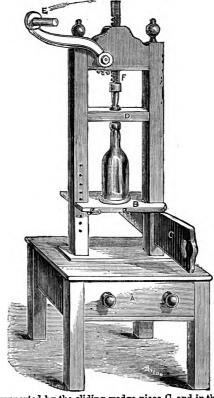
It is announced in the "Moniteur" that His Majesty the Emperor, accompanied by General Ge Failly, went to the Depot des Marbres, to examine the models for the great bridge over the Straits of Dover, on Tuesday week. M. Boutet carefully explained to His Majesty the various details connected with the construction. The Emperor, with a view to convince himself of the value of the system, stood upon one of the little models, and expressed himself astonished at the incredible rigidity which it possessed in every respect, and the relative lightness of a locomotive and tender constructed on the scale of the bridge. His Majesty then proceeded to examine the little bridge intended for the school at Vervius (Aisne), and walked over the footbridge which is almost finished, and which is to unite the Senlis promenade with the railway, afterwards turning his which is almost finished, and which is to unite the Seniis promenade with the railway, afterwards turning his attention to the mode of making the cables and trusses, questioning M. Boutet very closely and with much interest as to the facility of execution, and the great economy that will result from the application of the system to the construction of bridges in general. Before leaving, the Emperor went into the offices to see the large plans of the Channel Bridge, the details of which were carefully examined. His Majesty put several questions as to the expansion and Before leaving, the Emperor went into the offices to see the large plans of the Channel Bridge, the details of which were carefully examined. His Majesty put several questions as to the expansion and oxidation of the metal, as to the means of verifying the form of the bed of the sea, so as to facilitate the fixing of the piles, and getting them level in case the bed should be unexpectedly irregular—the questions displaying a thorough knowledge of the subject, and that he had studied the matter to its foundation. His Majesty warmly congratulated M. Boutet, and desired him to send his plans and pamphlet to him as soon as they were printed. M. Boutet availed himself of the opportunity to present Commander Porteu, of the Imperial Marine Artillery, and the promoter of a large bridge from St. Malo to St. Servan a Dinard, who, having visited Paris to consult M. Boutet on the subject, happened to be present at the moment of the Emperor's visit. Commander Porteu was very graciously received by His Majesty, who listened with great attention to his explanation of the advantages which will result from the construction of the bridge, which will be fully a kilometre in length, with but one support, at the Bizeux rock. M. Boutet showed the Emperor his plans for the said bridge, which is 20 metres in width, and is to carry a railway as well as a carriage way and pavement for foot passengers. His Majesty remarked that this would be a good application of the Boutet system, and that Commander Porteu might send him the memoir which he had prepared upon this project as soon as it was printed.

THE PEACE JUBILEE AT BOSTON, U.S. THE National Peace Jubilee at Boston commenced on Tuesday last, and will terminate to-morrow (Saturday). The jubilee is to con-

sist of the greatest musical festival ever known in sist of the greatest musical festival ever known in America, or, perhaps, in the world, and, according to the programme, will be a great noise. A huge building, called the Coliseum, capable of holding 50,000 persons, has been erected, and a chorus of 5,000 singers and an orchestra of 1,000 performers will provide the music. The chief singers of the country have volunteered their services, and the country have representations covered connections. musical programme contains several compositions prepared specially for the occasion. The programme abounds with colossal performances. Thus the overture from Wagner's "Tannhäuser" is to be given by a "select orchestra of 600 performers;" the Ave Maria sung by Parepa-Rosa is to have an the Ave Maria sung by Parepa-Rosa is to have an "introductory violin obligato by 200 violinists;" the "Star-Spangled Banner" is to be "sung by the full chorus with grand orchestra, organ, military band, drum corps, chiming of bells, and artillery accompaniment;" Meyerbeer's "Coronation March" is to be "performed by the full band of 1,000 instruments," and in the case of various popular airs, the "audience, to add to the effect, is invited to join in the singing." "Fifty trumpeters" will blow in "Fra Diavolo," and "one hundred anvils" be struck in the "Anvil Chorus," so that an idea of the stupendous scale and also the noise of the jubilee may be formed. The big drum to be used upon the occasion has The big drum to be used upon the occasion has been finished, and O'Baldwin, the Irish giant, has also been engaged to beat it. This mastodonian drum is 3ft. through from head to head; the heads are about 8ft. in diameter; for the skins, two mammoth oxen yielded up their hides, it being found impossible to procure the hide of an elephant, and upon each head is ironically painted "Let Us Have Peaco."

HEYER'S BOTTLE CORKING MACHINE.

THE annexed cut shows a very handy contrivance the invention of Mr. Heyer, of 101, Leatherlane, Holborn. The stand A carries an upright frame, in which the apparatus is held. The movable rest B is hinged on a pin at the left end, and can be raised or lowered according as long or short bottles have to be corked. The other end is



supported by the sliding wedge piece C, and in the centre is a circular swivelled plate, upon which the bottle rests. In the bar D is a brass tapering guide tube through which the cork passes, and in which it is compressed, the lower portion of the tube being corrugated vertically. The rack F is furnished with a plunger, which is brought to bear upon the cork by moving the handle E about a third of a turn in the direction of the arrow. The arrangement is simple, and enables the operation of bottling to be performed with rapidity and accuracy.

A LARGE gymnasium for the use of the troops is being erected at the Huts Encampment, Pembroke Dock. The cost is expected to be about £1,000.

THE SEWERAGE AND DRAINAGE OF BROMLEY, KENT.

THE SEWERAGE AND DRAINAGE OF BROMLEY, KENT.

YESTERDAY afternoon, a deputation from the local board of Bromley, Kent, had an interview with the Secretary of State with reference to the drainage and sewerage works in contemplation at that place. The immediate object of the deputation was to obtain a further inquiry into the merits of the scheme proposed by the board, under the advice of Mr. Arthur Jacob, C.E., who prepared the necessary plans and estimates. The inquiry was requested with the view of obtaining the sanction of a loan of £54,000, to assist in purchasing the land required for the purpose of irrigation, and carrying out the necessary works. The deputation comprised Mr. W. D. Starling, Dr. Farr, Dr. Slott, Dr. Hughes, Mr. West, Mr. Muffet, Mr. Latta, the clerk to the Board, Mr. Ryde, Mr. Chambers, and Mr. Jacob, the engineer for the proposed works. The right honourable gentleman received the deputation in his usual courteous and polite manner. He alluded to the fact that the proposed project had been most favourably reported upon by Mr. Morgan, who conducted a former inquiry on the subject. Mr. Rawlinson also fully concurred in the report of Mr. Morgan. While admitting the soundness, validity, and the engineering merits of the project, Mr. Bruce regretted that at present he was unable to give a decisive answer to the request of the deputation. He would, however, take it into consideration, and authorize a further investigation of the whole question, with especial reference to the allegations put forward by the adjoining landholders in the matter of residential damages.

#### BUILDING CONTRACTS.

BUILDING CONTRACTS.

THERE is, perhaps, no class of contracts in which greater recklessness of consequences is shown than in building contracts. When the owner of land wants to build upon it he generally chooses an architect in whom he has confidence, and then advertises for tenders for the buildings, and having chosen a contractor to do the work, he confides the superintendence of the erection of the buildings to the architect. One of the commonest terms in building contracts is, that the work is to be paid for by instalments, as it progresses, on the architect giving certificates from time to time that the work is properly done. It is also generally stipulated expressly that no money is to be paid either during the construction or on the completion of the building unless the builder obtains from the architect a certificate that the building is being built or is completed, as the case may be, to his satisfaction.

Such a stipulation as this practically leaves the builder entirely at the mercy of the architect, who is thus placed in the position of an arbitrator between the landowner and the builder. The effect of these stipulations in building contracts has more than once come before the Courts. In Clarke v. Watson (18 W. R. 345) the action was by a contractor against a landowner for payment for work done under a building contract which required (in the usual form) that the plaintiff should not be paid until the defendant's architect had given a certificate that the work was properly completed. The declaration averred that the architect withheld his certificate improperly, and claimed payment as if the certificate had been given. The Court held on demurrer that the declaration was bad, and that the improper refusal of the architect to give the certificate which was precedent to his right of action against the defendant.

This latter point arose in the case of Davis v. Taylor, in the Court of Exchequer last week. The against the defendant.

planting of the cointion that he should go certificate which was precedent to his right of action against the defendant.

This latter point arose in the case of Davis v. Taylor, in the Court of Exchequer last week. The action was by a builder, under a building contract in the ordinary form, against the architect. The declaration alleged that the defendant knew that the plaintiff had properly completed the work, and that, without reasonable cause, and fraudulently and maliciously, and to injure the plaintiff, he withheld his certificate, whereby the plaintiff was unable to obtain payment from the landowner. There was a demurrer to the declaration, and the Court have reserved their judgment. Clarke v. Watson shows that if the architect, in such cases as these, chooses to withhold his certificate, however improperly, the builder is entirely without remedy against the landowner, as he has not got the certificate, and it has hitherto been the general opinion that no action could be maintained by the builder against the architect, who is under no duty towards the builder either by contract or otherwise.

It would seem from a dictum of Willes, J., in Clarke v. Watson, that if the architect refused to exercise his judgment, and declined to consider the matter at all, the proper course for the builder would be to call upon the landowner to appoint some other architect to act in the matter. If the landowner refused to do so, it is possible that the builder might have a remedy, as the landowner might then be considered as being in the position of a person who had never appointed an architect, and had thereby himself rendered the performance of the condition precedent impossible. If the landowner by any act of

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his own, prevents the builder from getting the certificate, the absence of the certificate cannot be raised by the landowner as a defence to an action by the builder. It has been decided (Batterbury v. Vyse, builder. It has been decided (batteroury v. vyso, 11 W. R. 891) that if the architect refuses to give the certificate in collusion with the landowner, the builder is relieved from the necessity of obtaining it, and can maintain an action for payment without

It does not often happen, however, that an archi-It does not often happen, however, that an architect refuses to come to an opinion on the subject of the works under his charge, or that a landowner can be proved to have caused his architect to refuse a certificate, or that it can be shown that an architect has arted maliciously in refusing a certificate. The ordinary case is (and it is one that frequently happens) that the architect, whether rightly or wrongly, has himself formed an opinion that the works are not properly done. The correctness of this opinion cannot in these cases be subjected to any test, as the builder has beforehand engaged that his test, as the builder has beforehand engaged that his payment shall depend upon the contingency of get-ting his certificate.

So far we have only dealt with the builder's rights so far we have only deart with the outlet's light at law, but in equity he is in no better position. In Bliss v. Smith (34 Beav. 508) it was held that a builder had no remedy against a landowner whose architect refused to give a certificate, unless there was either fraud or the accounts were too complicated. was either fraud or the accounts were too complicated to be taken at law. Practically, the builder's position is the same in equity as at law. The builder under an ordinary building contract is, therefore, entirely at the mercy of the architect, who is a judge from whose decision there is no appeal.

The chief objection to such a state of things depends not so much upon the fact that the builder must submit to the decision of the architect, because that is nothing more than is voluntarily accepted by every litinant who consents to an arbitration. The

must subinit to the decision of the architect, occasion that is nothing more than is voluntarily accepted by every litigant who consents to an arbitration. The real hardship is that the arbitrator is the architect, who is employed and paid solely by the landowner, and thus there may be a direct clash between the claims of the builder and the interests of the architect's employer. The architect is thus placed in a position which no one should occupy. It resembles somewhat the case of a man who is judge in his own case. Such a position renders it possible for an unscrupulous architect to do great injustice, and at the same time, makes it difficult for one who is scrupulous to do his employer justice, and it ought, therefore, to be avoided. We do not for a moment mean to say that architects placed in this position do not generally do their duty and do it well. On the contrary, we believe that in the majority of cases they strive to do justice to both parties; but notwithstanding this, they are necessarily open to suspicion on account of their position, which in itself is far more difficult than that of an ordinary arbitrator who is equally

their position, which in itself is far more difficult than that of an ordinary arbitrator who is equally independent of both parties.

The simplest remedy for this evil would be to appoint some independent person, who should, in case of dispute, be the ultimate arbitrator between the builder and the landowner. It would be easy to adopt a form of contract which should contain such a provision, and if builders were once thoroughly aware of the legal construction of their ordinary contracts, it is probable that they would, in their own defence, insist upon the insertion of some such provision as we have suggested. In the meantime, provision as we have suggested. In the meantime, some good may be done by pointing out the objections that there are to the common form of building contracts which is now generally in use.—"Solicitors' Journal."

#### THE PACIFIC RAILWAY.

THE Government of the United States appointed a Commission to examine and report upon the Pacific Railway. The Commissioners have lately issued their report, which states that with the completion of certain works yet requisite to supply deficiencies, and which are estimated to cost about £2,500,000 sterling, the road may be accepted as a first-class one, according to the understood meaning of the law passed for its construction. It will be remembered that this line was constructed with great rapidity, and it appears that this haste has been followed by a great want of care in attending to the various points connected with the proper location of the line, especially in the part across the Sierra Nevada. The curves are said to be excessive and needlessly sharp, and descents are multiplied over and over again without necessity. Gradients of 70ft, to 80ft, per mile are often introduced, where one of 53ft, per mile would have been ample, and gradients of 53ft, per mile where not more than half that rate of ascent was required. In the Humbol t valley, between Humbol t lakean: Humbolat Well, the difference of elevation is 1,111ft.; and in overcoming this tie ascents and descents amount to 6,232ft., involving, in a distance of 290 miles of road in this most practicable valley, a loss of elevation greater

trains to be hauled up an aggregate of ascents more than equal to that on the principal lines between the eastern coast of the Ohio River Valley. These are all matters which, by a little care and consideration, might easily have been avoided.

#### FOREIGN COAL AND IRON.

M. DE DORLODOT FRERES, of Acoz, have concluded a contract for 10000 concluded a contract for 10,000 tons of rails on Russian account; this contract has been nego-tiated through M. Armand Bouquié, of St. Peters-The Charleroi Chamber of Commerce has just issued a report on the metallurgical production It appears that the of that district during 1868. value of the pig and castings made in the group in 1868 was £1,171,636, as compared with £914,754 in 1867, and £1,048,950 in 1866. Iron was made in the same group last year to the value of £1,437,978 as compared with £1,368,812 in 1867, and £1,724,108 in 1866. Small current orders for iron of every description continue to reach the Belgian works, and prices are maintained with firmness in all the groups, as well for plate as for merchants' iron. The demand for iron conas for merchants from. The demand for iron continues active in the Haute-Marne; rolled iron from mixed pig has made £9 to £9 8s. per ton, while rolled iron from coke-made pig has realized £8 4s. to £8 8s. per ton. Iron has been in active demand in the Ardennes, and at Paris the advance in prices has become more and more deviced. prices has become more and more decided, both as regards iron for building purposes and coke made merchant's iron. There is not much change to report in the Belgian coal trade; at some workings there has been, however, a certain amount of activity, as it has been deemed advisable to expedite deliveries in consequence of the approaching closing of navigation.

#### SIZE FOR DRESSING COTTON YARNS.

N the process of sizeing and dressing cotton yarns or cotton warps it has been customary to a size composed of flour, china clay, tallow, and oil with an alkaline substance. An invention, however, which has recently been patented by Mr. P. M. Crane, of Manchester, oil manufacturer, consists in the employment of paraffin as a constituent in the formation of sizeing and dressing compounds for cotton materials. This substance may be added to any of the usual sizeing compounds with the most beneficial results. We give the following composition as an example of a size which Mr. Crane has found to answer well:—Flour, 280lb., or one sack; tallow, Ilb.; paraffin from 1 per cent. to 2 per cent. of the flour employed. Another useful combination consists of—Flour, 280lb., or one sack; paraffin, from 5 to 10 per cent. of the flour employed. The paraffin can be thus made to take the place of the whole or a portion of the tallow usually employed. Sometimes, in addition to the above, Mr. Crane employs a small amount of alkali. These proportions will do for the usual purposes of sizeing, but if it is desired to give the cloth more body, or to make it stiffer, a much larger proportion of paraflin may be used. The materials are intimately mixed with water, and incorporated by heat so as to form the size.

#### COAL AND IRON IN THE UNITED STATES.

THE quantity of iron made with bituminous coal in Pennsylvania in 1868 was 194,000 tons (in round figures), as compared with 191,072 tons in 1867. The production of iron made with anthracite coal in Pennsylvania last year amounted to 671,955 tons, as compared with 594,270 tons in 1867. The production of anthracite iron effected last year in Pennsylvania involved the consumption of 1,512,000 tons of coal. The production of rolled from in Pennsylvania last year is computed to have been 520,000 tons, as compared with 490,081 tons in 1867. Railway iron figured in the total for 1868 to the extent of 276,500 tons, and in that of 1867 to the extent of 245,081 tons. In 1868 the rolling mills of Pennsylvania consumed 1,210,000 tons of coal, of which 380,000 tons were anthracite, and the remainder bituminous. It is curious to observe that, notwithstanding the great increase in the demand for railway iron in the United States since the close of the war, the native production does not appear to have been very materially extended. In fact, old iron rails have been shipped to a rather considerable extent of late from

5,727 tons, while 20 small cargoes, representing 3,394 tons, were also received at Baltimore via New York. The engineers of the Grand Trunk Railway of Canada, in a report to the directors, state that rails lately re-rolled in the United States and at Toronto have proved superior to new rails imported from England. It is proposed to build an imported from England. It is proposed to build an iron bridge on the Wisconsin division of the Chicago and North-Western Railway, over the Fox River, at Oshkosh. The track on the Iowa division is being relaid with new rails of the American fish-plate pattern; the new rails are already laid for a distance of about 15 miles. The quantity of pig made in Pennsylvania in 1868 was 925,000 tons; of this total, 672,000 tons, or about 73 per cent. of the whole, was made with anthracite

NEW TYPE-SETTING AND DISTRIBUTING

NEW TYPE-SETTING AND DISTRIBUTING MACHINE.

MR. M. UMSTADTER, of Norfolk, Va., has completed a machine which he states will justify ten thousand characters per hour, the work being done with far greater exactness than can be found in any printed book. The Norfolk "Virginian," in speaking of this invention, says respecting it:—Other machines have been invented and put in operation, but the trouble with all has been the want of any appliance for "justifying," or making the lines the same length, with due regard for the space between words and the proper division upon syllables. This has, in every instance heretofore, been done by hand, and thus, as labour-saving implements, the previous inventions have been of little value. To obviate this difficulty has been the chief care of the inventor in this instance, and he claims that his machine will set and "justify" as many types in a given space of time as six men. The justification is effected by a space of his own invention, of this shape X. formed of brass or steel strips riveted together in the middle, and capable of being compressed into one-half of the ordinary thickness. The machine proper is 2ft. wide and 30 in. long, divided into as many compartments as there are different types; into these compartments the types are placed in the proper position, filling the chember, into which they fit loosely, their own weight keeping them pressed down to the bottom. In front of the machine is a double row of iron keys, lettered to correspond with the chambers of type. By pressing upon one of these keys, a type is forced from the bottom of one of the chambers into an iron trough, fitted to the exact thickness of the size of type used, so that, when once in the trough or slide, it is impossible for it to fall over on its side. Underneath this itted to the exact thickness of the size of type used, so that, when once in the trough or slide, it is impossible for it to fall over on its side. Underneath this trough runs a belt, furnished with steel hooks or teeth, and driven by a treadle beneath. These hooks convey the type along the trough to an apparatus at the end of the machine, where they are placed in regular order until a line is full, when the striking of a bull appropriate the fearth of the constitution of the bull appropriate the fearth of the constitution. placed in regular order until a line is full, when the striking of a bell announces the fact to the operator, who, by simply pulling a small lever, places the line in an upright position on a frame. The machine can be seen at David Morris' establishment, in Union-street, where he is busily engaged upon an autematic distributing apparatus to be attached to the most him, when it will be the most perfect inventor. the machine, when it will be the most perfect inven-tion for the purpose yet brought before the public. The sample of the work sent to us is very good, but no better than what has been done by other machines for the same purpose.

#### TO CORRESPONDENTS.

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in

advance.
All literary communications should be addressed to the Editor of the MECHANICS MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. R. Smiles, MECHANICS MAGAZINE Office, 166, Fleet-street, London.
To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.
We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M. M.
Advertisements are inserted in the MECHANICS MAGAZINE, at the rate of 6d, per line, or 5d, per line for 13 inser-

ZINE, at the rate of 6d, per line, or 5d, per line for 13 insertions, or 4d, per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertise-

ments.

J. HOUGHTON, Wigan.—The price of the treatise for which you inquire is 10s. 6.1., by post 11s., and is sold by Messrs. Spon, of 48, Charing-cross.

A. B.—The only article which has of late appeared in the MECHANICS MAGAZINE, bearing upon the subject of your letter, is one on "Cleaning the Exterior of Houses," in our issue of April 16 last. We aivise you to apply to Messrs. Ransome and Co., of 2, Queen's-place, Southwark Bridge; they have a method of preserving stone, &c., and might assist you.

ARTHICIAL FUEL—If any 'f our readers can oblige us with the address of a maker of apparatus for the manufacture of artificial fuel by pressure, they will confer a favour.

RECHYED.—H. T. E.—J. N.—B. V.—G. E. P.—F. S. U.

most practicable valley, a loss of elevation greater than that of the summit of the Alleghany Mountains above the Atlantic seaboard, and requiring ceived direct from English ports to the extent of J. T. C. S. B. T. G. S. K. M. G. T. A. B. P. R.



J. L.—J. B. and Co.—C. M.—A. H. W.—R. T.—H. B.— R. C.—W. P. G.—R. M. S.—G. E. P.—T. C.—J. A. B. and Co.—H. W.—J. T. M.—B. O.

## Meetings for the Meck.

FRI.—Royal United Service Institution.—Captain H. M. Hozier, 3rd Dragoon Guards, Topographical Staff, on "The Abyssinian Campaign," at 3 p.m.

# Habal, Military, and Gunnery Items.

THE following notification has been issued from the Admiralty:—The Bermuda dock, towed and accompanied by a squadron of Her Majesty's ships, will leave Sheerness about the 20th inst., for Madeira and Bermuda. All vessels approaching the flotilla should be prepared to take precautions to avoid the risk of collision.

Last week the Master and Brethren of the London Trinity-house laid the foundation stone of a new lighthouse to be erected on Souter Point, a headland on the Durham coast, between the Wear and Tyne. It will be erected to prevent wrecks from occurring if possible on Whitburn Steel, of which there have been so many complaints within recent years.

ADMIRAL LORD NELSON'S famous Trafalgar flag-ship, the "Victory," is to be maintained en permanence at Portsmouth, the Admiralty having issued orders that men from each of the light infantry divisions of the Royal Marine Light Infantry, together with a proportion of gunners from the Royal Marine Artillery, shall be selected for service on board the ship.

We understand that Mr. Romaine, the Second Secretary to the Admiralty, has accepted the appointment of Judge Advocate-General in India, offered to him recently by the Duke of Argyll. Mr. Romaine was Deputy Judge-Advocate in the Crimea, and at the end of the War was appointed Second Secretary to the Admiralty by Sir Charles Wood.

In the year 1868 sums amounting to £27,672 were received by the Board of Trade from masters of vessels, collectors of customs in the colonies, and consuls abroad, for wages and effects of 4.872 deceased seamen. Sums amounting to £20,444 were paid in 1868 to the relatives and representatives of of 2.685 deceased seamen. After seven years, sums unclaimed are paid into Her Majesty's Exchequer.

THE "Inconstant," the pioneer of the new type of unarmoured iron-built flying ocean cruisers, introduced into Her Majesty's Navy by the present Chief Constructor, of 4.066 tons, 1,000-horse power (nominal), to carry ten 12-ton and six 6½-ton rifled guns, has completed her armament in the steam basin of Portsmouth Dockyard, and is to have all her internal fittings completed in readiness for her measured mile trial of speed by the 29th inst.

At the close of the last Savings Banks year, on November 20, 1868, the account of deposits received by the Board of Trade under the Seamen's Savings Bank Act of 1856 showed £52,997 due to 1,662 depositors. In the year 1868, 54,121 seamen's money orders for £271,897 were issued at ports in the United Kingdom, and 1,882 orders for £22,125 at continental ports. Since May, 1855, and down to the end of 1868, 450,486 seamen's money orders for £2,807,808 have been issued at home and continental ports.

The preparations in progress at the Naval Observatory and in the Navy Department at Washington, for the observation of the total eclipse of the sun of August next, are on a very extensive scale. Two parties will be sent out to Des Moines, lowa. They will be furnished with an outfit equal to any yet supplied by any government for a similar purpose. The most skillful party of photographers at the command of the Department will accompany the expedition. A party in charge of Professor Asaph Hall, of the Observatory, and Professor Joseph Rogers, assistant, will sail in a few days for San Francisco, with a very complete outfit. On arrival in California, a war verseel will be put at their control, with orders to take the party to such place on the coast of Alaska or Siberia as may be selected.

The strength of the mercantile marine force in

or Siberia as may be selected.

The strength of the mercantile marine force in 1867 amounted to 196,340, and the number of deaths reported during that year was 5,283, yielding a proportionate mortality of 26.9 per 1,000 strength. The deaths from different diseases show that there were 367 from typhus, 214 from dysentery, 212 from cholera, 346 from yellow fever, 52 from purpura and scurvy, 151 from consumption, 1,808 by shipwreek, and 1,105 by other accidental drowning. Of the 5,233 deaths nearly half (2,442) occurred in the period of life 20-30 years. The number of deaths under 20 years of age was 932, at ages 31-40 the number was 799, at 41-50 it was 353, and at 51 years of age and upwards it was 106. The rating returns show that 2,015 of the deaths were those of able seamen, 612 were ordinary seamen, 434 mates, 433 apprentices and boys, 160 boatswains, 207 stewards, 153 cooks, 170 carpenters, 117 firemen, and 64

THE Registrar-General states—according to the returns received from his Royal Highness the General Commanding-in-Chief—that the strength of the army, at home and abroad, in the year 1867, was 200,335,—viz., at home, 87,607; abroad, 112,728. In England and the Channel Islands the strength was 60,344; in Scotland, 3,517; and in Ireland, 23,746. In the total strength at home the deaths were—of officers 49, of non-commissioned officers and men 901, representing a mortality in the former of 10-95 per 1,000, and in the latter of 10-84 per 1,000. In Great Britain the death-rate of officers was 12-55, in Ireland 6-62 per 1,000. In Great Britain the death-rate of men was 12-06, in Ireland 7-54. In the total strength abroad, in 1867, the deaths were—of officers 81, of men 2,203, representing a mortality of 13-33 per 1,000 in officers, and 20-66 in men. In 1865 the mortality of men abroad was 21-02; in 1866 it fell as low as 15-49 per 1,000.

it fell as low as 15-49 per 1,000.

The fellowing are the particulars of the Russian fleet, as given in the "Journal of St. Petersburg," from the report of the Ministry of the Marine:—On the 1st of January, 1869, the fleet counted 230 steamers and 37 sailing vessels. The former consisted of the following armour-plated vessels:—4 frigates, 3 batteries, and 13 monitors. Non-plated vessels—6 ships of the line, 8 frigates, 18 corvettes, 7 clippers, 62 gunboats, 6 vessels called "vapeurs-frigates," 4 imperial yachts, 13 schooners, 22 transports, 48 dispatch boats, and 16 chaloupes. The sailing vessels consisted of 5 yachts, 4 schooners, 15 transports, and 13 chaloupes. Of these, 156 vessels were in the Baltic, 1 in the White Sea, 30 in the Caspian, 41 in the Black Sea, 31 on the Eastern coasts of Siberia, and 22 in the sea of Ural. There were, in addition, 4 plated frigates and a steam yacht on the stocks in the Baltic, and 2 gunboats on the Siberian coast.

# Miscellanen.

THE annual conversazione of the Royal Institute of British Architects will take place at the rooms of the Institute, 9, Conduit-street, Hanover-square, on the evening of Thursday, July 1 next.

A FIRM in Oshkosh, Wisconsin, has contracted to make 1,000,000ft. of wooden tubes, to lay down in that city for gas pipes. They are made of timber 6in. square, bored in the same way as pump barrels.

The number of visitors to the Patent Office Museum, South Kensington, for the week ending June 12, was 3,130. Total number since the opening of the Museum, free daily (May 12, 1858), 1,581,866.

Mr. T. Brassey has just completed his tour of inspection over the projected new railway from Innspruck, via Feldkirch, to the Bodensee, and his opinion seems to incline in favour of the improved Fell's system over the Arl Mountain, instead of tunnelling through it.

The "Portland (Maine) Advertiser" was recently printed on paper made of a kind of material said to have been never before used in the manufacture of paper—Zizania aquatica, or water rice. It grows in great abundance in many places in the northwest of America.

New York is suffering from a peculiar strike. The hotel waiters, who, like every other branch of working people, have a trade union, on June 1 demanded an increase of pay from thirty dollars a month, which they then got, to thirty-five dollars. It was refused, and they struck.

WITH a view of preserving the relic of Roman London—known as "London Stone"—from any further injury, the London and Middlesex Archeological Society, in conjunction with the churchwardens of St. Swithiu's Church, Cannon-street, have had placed over the casing stone a neat iron scroll guard. It is also their intention to have fixed a tablet as a memento of its origin.

THE number of visitors to the South Kensington Museum during the week ending June 12, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 10,185; Meyrick and other galleries, 1,761; on Wednesday, Thursday and Friday (admission 6d.), from 10 a.m. till 6 p.m., 2,839; Meyrick and other galleries, 228; total, 15,018. Average of corresponding week in former years, 10,268. Total from opening of Museum, 8,518,265.

A LETTER was recently read in the Legislative Assembly of Victoria, written by Mr. Robertson, of Colac, stating that between April, 1868, and the end of that year, he had a hundred men engaged on his run killing rabbits, and about 2,000,000 were killed, at a cost of £5,000. This year he has sixty men engaged on this work. It is thought likely that the impossibility of extirpating the pest on large runs will hasten the division of the land into small farms, and thus the acclimatized rabbit may exert an influence as an agrarian reformer.

NEAR Peruwels, on the Belgium frontier, a man recently presented himself early in the morning with two large elms on a timber truck, drawn by three

horses. Something about the trees attracted the attention of one of the Custom House officers, and he proceeded to examine them. He found that they had been cut open, hollowed out, and very carefully put together again, the bark, where removed, having been glued on. In the cavity thus formed, 627 kilos of tobacco were concealed. The man was taken into custody, and all the property seized.

THE Committee of the Palestine Exploration Fund have opened at the Dudley Gallery an exhibition of pottery, glass, and jewellery, the results for the most part of recent excavations at Jerusalem. In many respects the display is exceedingly interesting, especially the pottery and the lamps. A great many of the most remarkable objects come from Mount Olivet and Mount Sion. Among the jewellery are some specimens of work in silver. There is a well executed model of Jerusalem, lent by Colonel Sir H. James, and a very good collection of photographs of the Holy Land.

graphs of the Holy Land.

THE Council of the Society of Arts have this year awarded the Albert gold medal to Baron Justus von Liebig, associate of the Institute of France, foreign member of the Royal Society, Chevalier of the Legion of Honour, &c., "for his numerous valuable researches and writings, which have contributed most importantly to the development of food-economy and agriculture, to the advancement of chemical science, and to the benefits derived from that science by arts, manufactures, and commerce." This medal was instituted to reward distinguished merit in promoting arts, manufactures, or commerce.

FROM the report of Mr. Wyndham, Secretary of Legation in Belgium, it appears that in the first five months of 1868, 22,819 head of cattle were axported from that country. This was a large increase on the exports during the same periods in 1867 and 1866, 19,971 head of the exports were sent to France. The export of sheep from Belgium to other countries was also on the increase. Butter forms a large staple of the trade between Belgium and England; the amount exported in the first five weeks of 1868 to England was 4,000,000lb. Rabbits, poultry, and game are sent almost exclusively to England.

England.

The whole quantity of land which has been enclosed in England and Wales, or is in the process of being enclosed, since the passing of the Enclosure Act of 1845, is 614.804 acres; to be reserved for exercise and recreation, 1,742 acres; to be reserved for labouring poor, 2,223 acres. It may safely be assumed that not more than three-fifths of the 614.804 acres (or 368,000) are lands waste of a manor, or subject to rights, as defined in secs. 80 and 31 of 8 and 9 Vict., cap. 118, and upon which alone, therefore, under that act, allotments for exercise and recreation, or for labouring poor, could be required by the Enclosure Commissioners.

The Chemical Society wishing to de honour to

THE Chemical Society, wishing to do honour to the memory of its late distinguished Fellow, Professor Faraday, and at the same time to promote the personal intercourse of the society with eminent foreign chemists, has recently instituted a Faraday Medal, to be awarded from time to time to some foreign chemists upon his accepting the invitation of the president and council of the society to deliver a lecture to the Fellows. The inaugural lecture will be delivered on the 17th of June, by M. Dumas, Master of the French Mint, and perpetual Secretary of the Imperial Academy, who was one of Faraday's intimate friends. By permission of the managers, the lecture will be given in the theatre of the Faraday's own expositions.

The Madras Railway Company have received advices of the opening of their North-west line to Gooty, on the 11th ultimo, for the running of trains with materials. This extension of thirty-one miles will be open for public traffice from the 1st proximo. The length of this line from Madras is thereby increased to 258 miles, and the important town and district of Gooty, with the adjoining cotton-fields of Bellary, Adonie, and Kurnool, are brought into railway communication with the presidency, and a shipping port for their produce. The construction of the branch line to Bellary, and the continuation of the main line to Raichore, the point of junction with the Great Indian Peninsular Railway, is well advanced, and will be materially promoted by the extension of the railway which has just been accomplished.

plished.

AT a general meeting of the Fellows of the Royal Botanic Society, held on Saturday, Mr. C. R. Turner in the chair, the following were proposed and elected Fellows of the society:— Messra. William Murray, Coryndon H. Luxmoor, James Vickers, John Stefanovich Schlizzi, Mrs. John Harborrow, Messrs. A. Lang Elder, W. Stafford Northcote, Lieutenant-General W. Cartwright, Miss Richards, Captain F. H. Smith, R.N., and Keith Stewart Mackenzie. The chairman of the Garden Committee called the attention of the meeting to the palm trees in flower in the open garden; they had been in their present position for about 10 years without any protection during the coldest winter. Two nearly allied species of chamerops in the Society's conservatory are also in flower.

THE meeting of the Royal Horticultural Society, held on Tuesday last, was the most attractive.

Tuesday show of the season. Among the many attractive objects perhaps Carter's double pelargona, which obtained the first prize, were the most effective. M. Baulant's artificial flowers were wonderful imitations. The lilacs were scarcely distinguishable from real specimens. The council awarded M. Baulant their Flora medal for this splendid dis-M. Baulant their Flora medal for this splendid display. Lord Londesborough presided, and the following candidates were elected Fellows of the society, viz.:—Mrs. Charles Baring, Mrs. H. R. Bran, Alfred John Cholmley, Earl Cowley, K.G., C.C.B., Hon. Mrs. Charles Eliot, Hon. R. Grosvenor, M.P., Sir Thomas Dick Lauder, Bart., William Mein, and William Smith, and the Keighley Floral and Horticultural Society was admitted into union and Horticultural Society was admitted into union.

THE receipts of cotton at the American ports showed a considerable increase in the last five weeks showed a considerable increase in the last five weeks of which we have returns, amounting, in the week ending April 30, to 22,021 bales, as compared with 18,823 bales in the corresponding week of 1868; in the week ending May 7, to 22,441 bales, as compared with 15,245 bales in the corresponding week of 1868; in the week ending May 14, to 22,207 bales, as compared with 10,707 bales in the corresponding week of 1868; in the week ending May 21, to 18,080 bales, as compared with 8,572 bales in the corresponding week of 1868; and in the week ending May 28, to 16,409 bales, as compared with 6,142 bales in the corresponding week of 1868. The aggregate receipts of the American ports to the close of May, 1869, in 1868-9 were thus increased to 2,236,217 bales, as compared with 2,237,804 bales to the close of May, 1868, in 1867-8.

RECENT communications from Adelaide. South

RECENT communications from Adelaide, South Australia, have made known the discovery. in the Australia, have made known the discovery, in the southern portion of the colony, of a remarkable carboniferous substance, which, hitherto, has only been found in small quantity in the coal strata of Derbyshire. It is a "mineral caoutchouc," so called from its general appearance and some elasticity. In Australia it is found on the surface of the sandy soil, through which it would appear to exude from beneath, as, burnt off occasionally by the bush fires, it is again found after the winter season, occurring in quantity and of various thickness. Analysis in quantity and of various thickness. Analysis proves it to contain 8.2, or more, per cent. of a pure hydro-carboniferous oil; its value for gas-producing purposes would, therefore, be great, and it is believed to be applicable to the manufacture of certain dyes. The discovery is also important from its indication of the existence of oil or other carboniferous deposits beneath the surface.

THE statistics of the book trade at Leipsic show that one-sixth of all German books is published there. The increase of the trade may be seen from the fact that in 1789, 855 works, and in 1859, 1,582 works, were sent from the Leipsic presses. Some of the Leipsic periodicals have an enormous sale. The weekly "Gartenlaube" circulates 280,000 copies. There are at present in Leipsic 47 printing establishments, which employ 1,000 men, 450 women and 300 apprentices; 100 binding shops, employing 400 binders and 160 apprentices. The music printers of Leipsic print one-third of all the music published in Germany. The book exchange at the fairs is visited by booksellers from all parts of Germany. At the Easter settling day in 1868, 3,500,000 thalers changed hands; and it is calculated that the yearly business exceeds £1,000,000 sterling. Leipsic has become such a recognized centre for bookselling that there are in it 1,282 depots of firms established in various parts of Germany. eekly "Gartenlaube" circulates There are at present in Leipsic 47

Among the most important and best "got-up" of continental scientific works, may be classed "Les Grandes Usines," by Turgan. Our present series of articles on the "Manufacture of Caps and Cart-ridges," is drawn from its valuable columns. The last three numbers contain a theoretical and practical description of the colouring of tissues, accompanied description of the colouring of tissues, accompanied by numerous cuts, diagrams, and double page illus-trations, executed in that peculiarly artistic and effective manner for which the engravings of our contemporary are remarkable. "Les Grandes Usines" has marked out a particular literary career for itself, and embraces within its sphere the description of most of the large and important manufactures and industries to be found throughout the continent. It will be within the recollection of our readers that both the establishments of M. Krupp, at Essen, and that at Creusot, were fully described in its columns. Our limits do not permit us to transcribe so much of "Los Grandes Usines" as we could wish, but we invariably exercise our privilege of selection for the benefit of our readers.

# Butents for Inbentions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system

of classification adopted, the numerical and chronologica of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclu-sively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledg-ment:—

BOILERS AND FURNACES-3691 BUILDINGS AND BUILDING MATERIALS-3642, 3650, 3668,

BUILDING AND BUILDING MATERIALS—3612, 3650, 3668, 3672, 3673, 3680
CHEMISTRY AND PHOTOGRAPHY—None
CULTIVATION OF THE SOIL, including agricultural implements and machines.—3615, 3621, 3627, 3643, 3664, 3679, 3683

3683
ELECTRICAL APPARATUS—3661
FIBROUS FABRICS, including machinery for treating fibre, pulp, paper. &c.—3617, 3618, 3520, 3623, 3633, 3647, 3648, 3654, 3658, 3665, 3669
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—None FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments. &c.—3614, 3616, 3628, 3630, 3639, 3640, 3641, 3645, 3657, 3659, 3674, 36761

3614, 3616, 3628, 3630, 3639, 3640, 3641, 3645, 3654, 3657, 3678,

SHIPS AND BOATS, including their fittings-3644, 3660 STEAM ENGINES-3619, 3626 Warfare-3622, 3637

3614 J. S. TEMPLETON, Glasgow. Curpets. Dated November 27, 1868.

In Brussels and Wilton carpets, as hitherto produced, those portions of the differently coloured warps which are not brought to the upper surface by the jacquard apparatus are confined in the body of the fabric between the wefts. By the present invention they are thrown entirely or to any desired extent to the under side of the fabric, so as to form a comparatively soft coating on that side.—Patent completed.

3615 A. C. Bahlett. Thirsk. Reging and mosting.

labric, so as to ferm a comparatively soft coating on that side.—Patent completed.

3615 A. C. BAMLETT, Thirsk. Reaping and mowing.
Dated November 27, 1868.

The first part of the invention consists in the use of a sliding segment of a cam applied to that class of reaper with self delivery at the back of the machine, and which deliver a sheaf for each revolution of the reel, the object of the improved or sliding cam being to make it deliver two sheaves for each revolution of the reel. The segment of a cam is fitted loosely on the reel shaft, and can be placed in working position or withdrawn by a lever similar to a clutch lever. The second part of the invention consists in placing a small wheel on the outside shoe in advance of the kuife, which, in crossing furrows, prevents the fingers running into the ground; and the third part of the invention consists in the better lubrication of the bearing where the knife is connected to the connecting rod. That part of the connecting rod is made hollow, thereby causing it to act as an oil cup, and thus lubricating that bearing in a much better manner.—Patent completed.

pleted.

3616 T. G. Webb, Manchester. Tumblers, &c. Dated November 27, 1868.

This relates, first, to the separation of those portions of articles of glass which have been attached to the "blowing fron," which separation is usually performed with scissors while the material is in a heated state. To accomplish this the inventor uses a diamond, fixed in a suitable frame, and causes the surface of the article to move against it through the medium of a revolving table; or, by a reversed operation, he keeps the article stationary and causes the diamond to revolve. By another method, he brings the surface of the article into contact with a wire heated by electricity, The required part having been severed, he glazes the edge by causing a stream of heat to impinge upon it by means of a furnace or a blow pipe.—Patent completed.

3617 J. PETRIK, jun, Bochdale. Washing 2001. Dated

of a furnace or a blow pipe.—Patent completed.

3617 J. PETRIK, jun., Rochdale. Washing scol. Dated November 27, 1868.

This consists in effecting the object by giving motion to washors through came or wheels and connecting rods driven from the centre of motion, on which the teeth revolve bodily or within the frame which carries them. Also, in mounting the rake upon a frame, to which a reciprocating motion is imparted, but the said rake is capable of turning upon an independent centre. The material having been lifted from the trough, a series of wheels causes the said independent turning of the rake upon its centre, whereby the material is delivered at the further end of the travelling surface.—Patent abandoned 3618 T. and A. L. DICKINS and H. HEYMOOD. Middleton.

further end of the travelling surface.—Patent abandoned 3618 T. and A. L. Dickins and H. Heywood, Middleton. Washing and dyeing sitk. Dated November 27, 1868.

This consists in placing hanks of yarn upon a framework or rollers submerged in a vat, and raised upward and lowered or otherwise moved therein; and the inventors also impart rotatory motion to the said rollers while they are alternately lifted out of and plunged into the fluid, or moved to and fro therein.—Patent completed.

moved to and fro therein.—Patent completed.

3619 W. E. NEWTON, Chancery-lane. Lubricators. (A communication). Dated November 27, 1868.

This consists, first, in casing around and within the neck of a glass reservoir a metallic collar, for the purpose of connecting the reservoir to the supporting stem. Second, in combining with the collar a threaded bushing or tube of harder metal, for the reception of the stem. Third, in employing within the hollow stem of a lubricator a regulating rod, provided at its upper end with an enlargement or projection, for the purpose of supporting the rod out of contact with the journal; and, fourth, in the use, in place of the regulating rod, of a hollow tube, open at the bottom, but closed at the top, and having a hole drilled in its side near its upper end, so as to communicate with the reservoir, the tube being screwed into the hollow stem, for the purpose of facilitating the regulation of the flow of cill to the journal or bearing.—Patent completed.

3620 J. H. Dales and J. F. Maygrova, Wood-street, E.C.

3620 J. H. Dales and J. F. Maygrova, Wood-street, E.C. Looms. Dated November 27, 1868.
This relates to an improved mode of manufactaring hair, cloth, and other similar fabrics, and also to improvements

in looms used therefor. The shuttle is fed or supplied with the hairs forming the weft alternately at either side of the warp, by which means the texture of the cloth produced is rendered much more uniform than hitherto, and is otherwise improved. The hairs are much less liable to break in weaving, and the manufacture is also greatly accelerated.—Patent completed.

rated.—Patent completed.

3621 A. M. CLARK. Chancery-lane. Paper clips. (A communication). Dated November 27, 1868.

These clips are composed, first, of a plate or clip, which is pressed down by the hand and raised by the action of a spring. Second, of a hinged clip, which presses on the plate for securing the paper on slips between them, the pressure being obtained by the aid of the same spring which raises the plate after it has been depressed by the hand. The papers or slips are secured between the hinged clip and the plate. The clip is raised by the action of the plate on bearing on the latter for the purpose of inserting the paper or slip, the slip being returned to position for securing the papers by the aid of the same spring. The clip may either move in a horizontal plane or describe portion of a circle, according as it turns on an axis apprendicularly (or nearly so) with the plate, or parallel therewith.—Patent completed.

3622 W. Tranter, Birmingham. Breech-loaders and

therewith.—Patent completed.

3622 W. Tranter, Birmingham. Breech-loaders and bullets. Dated November 28, 1868.

This relates, in the first place, to a breech-loading gun with a sliding block and lock moving as required in a solid frame perpendicularly, and at right angles to the bore of the barrel, by means of the guard acting in a slot or opening made in the frame for that purpose, the solid frame formed so as to admit of the stock being made in one piece. This solid frame has a strengthening rib on each side, which fits on the top edges of the stock, the lower part of the frame passing through the stock to the under side thereof. The guard, which is in one piece, is jointed to the lower side of the frame, and acts as a lever, working in a cavity formed in the lower end of the sliding block and lock, in order to cause the said block and lock to move upwards and downwards as required.—Patent completed.

3623 J. ISCHAM and J. BUTTERFIELD, Bradford. Dressing

to move upwards and downwards as required.—Patent completed.

3623 J. Ingham and J. Butterfield, Bradford. Dressing scarps. Dated November 28, 1868.

This consists, first, in the employment of a series of brushes having bristles in two opposite sides. These brushes are caused to travel in succession upon a borizontal bed a certain distance, then to drop upon another bed parallel to the former, on which they are returned, and are then raised to the first bed again, and so on continuing to travel forward on one bed and back on the other bed. Second, in the use of a series of healds for each single end or thread of the warp to pass through, so that any of the healds may be raised or lowered so as to separate each end or thread from the others, and also open a shed or sheds for taking the "leys" required in preparing warps for the loom. Third, in the application of apparatus for stopping the action of the machine when any of the ends stick fast. The apparatus consists of a reciprocatory bar and a lever, operated by any of the healds when the ends stick together on coming in contact therewith, which lever places a stop in position for contact with the reciprocatory bar, and the bar thereby operates upon and knocks or throwsoff the strap guide.

—Patent abandoned. Patent abandoned.

3624 E. S. SAMUELL, Liverpool. Superphosphate of lime. Dated November 28, 1863. The object is to utilize those phosphatic mineral deposits recently discovered in the siturian strata of this country recently discovered in the silurian strate of this country by manufacturing them into superphosphates suitable for agricultural uses. For this purpose the inventor first re-duces the phosphatic mineral to a fine state of division or powder, and then treats it with sulphuricacid and muristic acid, or sulphuric acid and chloride of sodium.—Patent abundoned.

abundoned.

3625 A. WYLLIE and J. LATHAM, Lancaster. Cracking nuts. Dated November 28, 1868.

The inventors support on strong framework by a hinge or otherwise a serrated or rough plate, capable of being adjusted by a set screw or its equivalent to any desired angle. Opposite to the serrated or rough plate they support in a similar manner another and similar serrated or rough plate to which they give a reciprocating or vibratory motion by an eccentric or crank coupled to or connected with it. The eccentric or crank is operated by or from any convenient power. Every time, therefore, when the machine is at work the reciprocating or vibrating serrated or rough plate makes a stroke, a number of nuts are cracked. By adjusting the serrated or rough plates at the required angle to each other, nuts of different sizes can be cracked at the same time.—Patent completed.

3626 H. J. H. King, Glasgow. Gauges. Dated Novem-

3626 H. J. H. King, Glasgow. Gauges. Dated Novemer 28, 1868.

3626 H. J. B. KING, Glasgow. Gauges. Dated November 28, 1868.

This consists, principally, in providing for checking the gauges at any time by originally marking a secondary or checking scale on the dial in addition to the ordinary scale, and by fitting a hook or ring in connection with the indicating mechanism, on which hook or ring a predetermined weight may be hung. The parts may be arranged so that the added weight will act either with or against the pressure, and the checking scale is marked in accordance with the difference the weight produces in the indications when the gauge is in order. Then if the elastic element of the gauge or the indicating mechanism gets out of order and the weight be applied, the indications by the checking scale will not agree with those by the ordinary scale without the weight; whereas, if the two indications do agree upon trial, the gauge may be relied upon as being as accurate as when first made.—Patent completed.

\* 3627 J. CORNES, Ilford. Mowing graus, &c. Dated No-

vember 28, 1868.

This consists in so constructing machines employed for the above purposes as to cause them to deliver the crops behind instead of in front of the machine. To effect this the inventor makes the spiral cutter act as an elevator, and also fit an oscillating box or receptacle, or hangs the same to the back part of the machine.—Patent abandoned.

3628 A. N. Burton, High-street, Reading. Fastening boots and shoes. Dated November 28, 1868.

In manufacturing this eyelet the inventor first cuts or stamps from a sheet of thin brass, copper, or other suitable metal, a "blank" or flat piece of suitable size and shape. The portion to form the tube of the eyelet is in this case in the centre of the blank with the parts which



are to form the shank or stem projecting on opposite sides therefrom, but, if desired, the shank may be formed by a piece projecting from only one side of the tube. The shank may be formed with T-shaped projections which are inserted through a slit or aperture in the material, and then turned and clinched over the same. The shank may also be provided with claws or points, which are forced into the material, and sasist in securing the shank or may be secured by an ordinary eyclet, but it is preferred to secure the eyelet by means of a rivet or rivets passed through the shank and the leather or other material, and for this purpose he employs a pair of shoe pliers provided with a flat punch to form the slit for the insertion of the shank and a round punch for forming the rivet hole.—Patent completed.

3629 W. E. Gedge, Strand. Perspectometer. (A communication). Dated November 28, 1868.

The perspectometer, the subject of this invention, is an instrument for fixing the perspective of an object with exactness. Constructed upon rules infallible, because based upon a natural law, it always gives certain results. The perspectometer is single or double; it is divided into 100 equal parts. The double perspectometical principle that the object to be reproduced be brought beneath two lines intersecting each other at right angles. To draw with the perspectounter, whether single or double, it is necessary to retire from the object which it is desired to reproduce until it can be wholly embraced, closing one eye and keeping the arm stretched without effort.—Patent completed.

3630 W. E. Gedge, Strand. Plate warmers. (A communication.) Dated November 23, 1868.

ing the arm stretched without effort.—Patent completed. 3630 W. E. GEDGR, Strand. Plate warmers. (A communication.) Dated November 28, 1868.

This improved plate warmer is in the shape of a cylinder supported on feet, and rendered portable by handles placed at the top. In its lower part are arranged one or more sliding pans or drawers, furnished with gratings or wire gauze for the reception of any kind of fuel. This apparatus opens at the side, one part of the cylindrical casing opening on hinges for the introduction of the plates.—Patent abundoned.

cylindrical casing opening on hinges for the introduction of the plates.—Patent abandoned.

3631 C. D. Abel, Southampton-buildings. Manufacture of steel. (A communication). Dated November 28, 1868. This invention relates to the manufacture of steel by means of the new article known as "pig bloom" or "pig scrap," according to the manner in which it is produced by the process described in the specification to certain letters patent, dated November 23, 1868 (No. 3569). The inventor first makes a small amount of pig scrap, and subjects it to the process hereafter described to test the result, preparing the pig bloom or pig scrap in large quantities. Care is taken to have the oxide and cast from mixed as intimately as possible. If pig scrap is used, which is in small pieces of loose texture, it is carefully picked over, and those pieces which are seen to contain any raw cast iron being rejected, the residue when cooled is screened so as to remove any loose ore from the mass. The pieces are then placed in crucibles, and heated as a substitute for blistered steel or wrought iron in the manufacture of cast steel, the process being conducted in similar crucibles and furnaces, and in the same manner as is practised in making crucible steel, excepting that pig scrap or pig bloom broken up is used instead of blister steel or wrought iron.—Patent abandoned.

3632 J. Sarward, St. Paul-street, Islington. Preserving

wronght iron.—Patent abandoned.

3632 J. Sarward, St. Paul-street, Islington. Preserving plants, &c. Dated November 28, 1868.

The tree or plant, or flower or leaves, are taken while in a perfectly dry condition, and dipped or otherwise coated with a preservative solution in the form of an adhesive varnish of a rapidly drying nature, and not containing much water; consequently, a spirit or hydrocarbon varnish is to be preferred, and a colourless varnish of bleached shellac and spirits of wine or rectified spirits of wood; naphtha will be found to answer the purpose. By the use of such coatings, the leaf or flower is rendered impervious to the access of the air or of dampness or moisture, and thus the leaf or flower will be preserved in its natural form in a rigid or partially rigid condition.—Patent abandoned.

doned.

3633 J. L. NORTON, Belle Sauvage-yard, Ludgate hill.

Dyeing and printing. Dated November 28, 1868.

At the present time, sumach is much used in dyeing and printing in order to cause other dyes to take better on to the fabrics or fibres or materials to be dyed or printed. Now, according to this invention, an extract of the bark of the hemlock tree is substituted for the sumach, and the desired result is so obtained more effectually and economically. The extract which it is preferred to employ is that known in commerce as extract of hemlock bark.—

Patent completed.

3634 J. Heaton, Langley Mill Derby. Treating and

is that known in commerce as extract of hemlock bark.—Patent completed.

3634 J. Heaton, Langley Mill, Derby. Treating cast tron. Dated November 28, 1868.
This relates to an improved method of constructing vessels or converters in which cast iron, when in a molten state, may advantageously be subjected to the nitrate of soda, or of nitrate of potash, or of mixtures of the same, for the purpose of effecting the purification of the cast iron or the conversion of the same into steel, and consists in the employment of a fixed converting vessel, which is provided with a discharge opening at the lower portion thereof, such discharge opening at the lower portion thereof, such discharge opening being furnished with a removable plug or stopper, or with a hinged or sliding door, in order that after the purification or conversion of the cast iron the contents of the converting vessel may be readily discharged without the necessity for removing or transporting any portion of the vessel, as has hitherto been the case. The closing plug or stopper, or hinged or sliding door, may be actuated by a screw lever or other well-known mechanical contrivance in combination or not with a special catch for securing the plug or door and enabling it to support the weight of the metal above it.—Patent completed.

3635 W. NATLOR, Mildmay-park. Railway braks.

completed.

3635 W. NAYLOB, Mildmay-park. Railway braks.
Dated November 28, 1868.

This consists in a waggon framing and in a series of weighted brake levers attached to one side of or underneath each waggon or carriage, and cach weighted with a peculiar pivoted weight. It is preferred to make this pivoted weight in the form of a disc, and to pivot it eccentrically but loosely to the frame of the vehicle or to a bracket attached thereto. To a pin in the centre of this disc the upper end of a short link is connected, the lower end of which is attached to the brake lever. So long as the brake lever is elevated (the brakes being off) the pivoted weight will have its centre of gravity perpendicular over the supporting pivot, and, consequently, no

weight is given out to the brake lever, but when the brake lever is lowered for the purpose of applying the brakes, the disc revolves as an eccentric upon its pivot, and the position of its centre of gravity is changed so as to cause it to act through the link upon the brake lever, and thereby hold the brakes on. This pivoted weight is also applicable to the levers of self-acting brakes. Each brake lever is connected to a way shaft, which applies the two brakes on the same side of the waggon by the action of short lever arms and push rods. The several brake levers weighted as hereinbefore described are suspended by a rope or chain, passing under or along each vehicle over fixed grooved guide pulleys and under pulleys attached to the weighted brake levers.—Patent completed.

3636 G. S. Brown, Leicester. Communicating in trains.

the weighted brake levers.—Patent completed.

3636 G. S. Brown, Leicester. Communicating in trains.

Dated November 28, 1868.

Each carriage carries a cord or other suitable communicator which is capable of being fixed at each end to the ends of a similar cord or communicator carried by the adjoining carriages, the last carriage at each end of a train having its cord or communicator connected to signal apparatus carried by the engine or guard's van. This apparatus consists of a spring catch, which, when in one position, is capable of holding a lever carrying a bell or a hammer to strike a bell, and when operated by the cord or other communicator is released from the lever or hammer, and thereby causes the bell to sound. The bell or hammer is acted upon by a spring which, when relossed by the spring catch, causes a sudden motion of the lever or hammer away from such catch.—Patent abandoned.

3637 W. SORER, Frier-street, Reading. Brech-loading

or hammer is acted upon by a spring which, when released by the spring catch, causes a sudden motion of the lever or hammer away from such catch.—Patent abandoned.

3637 W. Sofer, Friar-street, Reading. Breech-loading frearms. Dated November 30, 1688.

This consists chiefly in the peculiar combination of parts whereby the opening of the breech, the cocking of the piece, and the extraction of the empty cartridge shell, are simultaneously effected by one movement of the hand without changing the position in which the piece is held when being fixed. The breech is closed by a block which is hinged or pivoted at one side of the rear of the barrel, and which is raised and turned laterally on its pivot to open the breech. The block is perforated centrally to receive the firing pin, which extends through the block with its ends in the proper position for receiving the blow of the cock or hammer and transmitting the same to the cartridge. The cask is arranged in combination with a tumbler and lever in such a manner that the tumbler and lever always move together, while the cock, which is drawn back by the tumbler in cocking the piece, will remain in that position when the tumbler is moved in the opposite direction. This capability of disengagement from the cock or hammer is necessary to allow the breech may be opened and the cock or hammer thrown back to full or half cock simultaneously, and that the breech may be then closed without moving the cock. The hammer is acted upon by an ordinary bent or V-shaped mainspring connected to the hammer by a swivel. The extractor is provided with a hook or claw, which is formed and arranged to catch under the rim of the cartridge in the charge chamber. The extractor is attached to a bar which is fitted to slide longitudinally at the bottom of the breech chamber. This bar through an intermediate lover is connected with the hammer, and is operated thereby in the proper direction when the hammer is cocked and released. The trigger is arranged below the stock in the ordinary maner, and

of upon a separate tumbler.—Patent completed,

3638 L. PPEIPER, Walbrook-buildings. Fastenings for
bags, &c. (A communication). Dated November 30, 1868.

In the interior of a casing, attached to one side of the
frame of a bag or other similar article, are placed two
metal sildes, each having an angular end, where they meet
in the centre of the casing, which are pressed together by
means of springs. At the back of each of these sildes is
fixed a projection, having attached thereto a pin, and in
the casing are fixed two pins running at right angles to the
former. The springs are placed on the pins which are
fixed to the projections and slides, and when a knob or stud
which projects through the exterior of the framing of the
bag is pressed upon the angular ends of the slides, they
are forced apart, and the springs are pressed against the
pins fitted in the casing, but immediately the knob is released of the pressure, the reaction of the springs force
back the slides to their former positions.—Patent completed.

back the slides to their former positions.—Patent completed.

3639 J. S. FORBES, Stoke-upon-Trent. Manufacture of carthenware, china, &c. Dated November 30, 1863.

The materials required to be calcined are operated upon in a heating chamber, with a furnace at the front end, and a wall with an outlet for a chimney flue at the back. Flues are arranged so that when the furnace is lighted, the flames are carried along parallel flues under the floor of the kiln, and up side chambers into the interior of the same, by which the heating chamber is brought to a red heat. A charge of material is then calcinod and withdrawn, and a fresh charge introduced without the heat of the furnace being materially reduced. A drying room is constructed adjoining the kiln, the flues from which are connected with other flues under the floor of the drying room, thereby drying the material as required, without the aid of another furnace. The next process is to grind the materials after they have been roughly crushed by a stone breaking machine. The material having been roughly broken, is delivered by a hopper to crushing rollers, whence it is discharged into a chamber, placed over or adjoining a hopper, to feed a pair of French buhr or other suitable stones, whence after being ground it falls into a hopper, and is delivered to another pair of grinding stones, from which it passes into a closed chamber or washtub partly filled with water.—Patent abandoned.

3640 F. Hill, Euston-road. Organs. Dated Novem

filled with water.—Patent abandoned.

3640 F. Hill, Euston-road. Organs. Dated Novem ber 30, 1868.

The chamber containing the air in a state of compression communicates with the upper channel. When the valve or pallet actuated by the pressure on the key is depressed by the connection of a wire beneath it, the air enters the organ pipe. Below the pallet, and also attached to the wire, a valve is placed and surrounded by an airtight fexible leather casing, so that the pallet and lower valve move in the same direction by mutual action, whereby the pressure of the air on the pallet will be neutralized by the corresponding pressure on the lower valve.—Patent abandoned.

3641 B. A. Green Stread. Organization alote includes

3641 R. A. Green, Strand. Ornamenting plate, jewellery, &c. Dated November 30, 1868.

This relates to improvements in the method of orna-

menting various articles of jewellery, by the application thereto of raised or convex devices or designs in gold, silver, platinum, aluminium or its alloys, or other metal produced by the electrotype process.—Patent abandoned.

3642 A. M. CLARK, Chancery-lane. Tiles. (A communication). Dated November 39, 1868.

The invention consists in the application for roofing purposes of tiles made of ordinary cast iron, the form and dimensions being varied to suit all purposes, and of a more or less ornamental appearance as desired.—Patent completed.

more or less ornamental appearance as deaired.—Patent completed.

3643 D. Greig and J. Fernie, Leeds. Plough heads, sthesis, &c. Dated November 30, 1868.

This consists in casting steel plough heads in a metal mould, by which means much labour is saved in the production of such plough heads, and one mould will serve for the casting of an indefinite number of heads. The metal moulds or chills which are used for this purpose may be cast from models made in the ordinary way, or they may be east from moulds made in plaster, and they are preferred in steel, and they may be made to stand on the floor when fixed up ready for casting, but it is preferred to fix them with hinges to a frame, so that when the castings are made, the parts of the chill may awing open, and the casting be quickly extracted at the parts where the fluid steel first touches the chill; in some cases, a recess is made, into which loam is inserted to prevent the chill being cut away by the action of the steel. In these places, when possible, it is preferred to let the steel ascend into the chill from the bottom or sides instead of falling into it. The interior of the chills is coated with washers composed of clay, ground powdered blacklead, or they are smoked in the ordinary way. In some cases, it is found desirable to give a motion to the chill, to facilitate the operation of casting, and to insure a better face on the casting.—Patent completed.

3644 N. WEST and R. G. WEST, Upper Norwood. Pre-enting corrosion of rudder pins, &c. Dated November 30,

1868.

The inventors attach to the working parts, or to contiguous surfaces in metallic connection with them, blocks or pieces of zinc or other metal, electro positive to iron, but they prefer to use zinc, by means of fastenings, preferably of iron, taking care hat a clean surface of the zinc or other metals shall be forced into intimate contact with a clean surface of the iron or steel around each fastening, and that such surfaces and the fastening itself, when of metal, shall be preserved from contact with water, whereby the corrosion of the zinc or other metal immediately around the fastening will be checked, and the block or piece will be held in place, till wholly or for the most part dissolved.—Patent completed.

3645 J. MYERS and L. L. MORRISON, Leeds. Hats. Dated November 30, 1868.

This consists in the introduction of a wire at the edge of the brim, and in curving or curling such brim in its side elevation in an elliptical manner, and, further, in causing such brim to riso towards the crown of the hat.—Patent abandoned.

elevation in an elliptical manner, and, further, in causing such brim to riso towards the crown of the hat.—Patent abandoned.

3646 W. MACLELLAN, Glasgow. Fastesiags for rails, &c. Dated November 30, 1868.

This consists in a new or improved mode and means of fastening the rails of railways, with the holding recess, and jaws formed on or in one piece, with either the chairs or the sleeper of the rails as desired, by having a wedge-shaped feather formed on the inner face of each outside jaw of the chairs or sleepers, in a position near the centre of the outer side of the holding key or wedge of the rail, so as to enter into the slit of the hollow from key formed by the two end edges of the thin flat plate, out of which the key is formed on or in its outer face, bearing on the inner surface of the outer jaw, the lower edge of the teather wedge and key having their "bevel" or wedge surfaces, corresponding and acting on each other, so that as the hollow key is driven into the recess between the jaw and the rail, the lower wedge surface of the feather acts on the edge of the key, and opens its slit, and thus (in addition to the usual tightening action of the key between the jaw and rail), by this improved construction of wedge feather and key, the lower front side and corner is adepressed, so as to tighten the opposite and corner; and also when the upper surface of the fasther is formed with a wedge "tapper" against the rail, together with the additional wedge action of the inwardly rounder surface. At the lower and upper parts of the jaw when that is desired, while to hold the key in the tightened position to which it is driven, by a hammer or mallet in the usual manner, a small projection is formed on the head or inner under edges of the wedge feather, rounded off so as to enter or "take into" any one of the set of undulatory recesses, formed along the upper surface of the key, by the elasticity due to the hollow form of the key dwhich thus prevents it from shaking back loose, by the vibration of the rails, but st

3647 J. W. REID. Paddington. Bleaching vegetable fibre.

3647 J. W. Reid. Paddington. Bleaching vegetable fibrs. Dated November 30, 1868.

The inventor applies the solution of chloride of lime to the vegetable fibre in an airtight vessel, and raises the temperature to a moderate heat, viz., from 120deg. to 180deg. Fah. The heat which he finds by practice is most effective is from 150deg. to 160deg. Fah. During the application of the heat, he prefers to agitate the material in such a way as to expose the material alternately to the action of the bleaching liquor and the gas evolved therefrom.—Patent abandoned.

abandoned.

3648 W. E. NEWTON, Chancery-lane. Cleaning cotton, &c. (A communication). Dated November 30, 1868.

This consists of a seed chamber combined with a leaf chamber, under the slotted rack, or other similar device, arranged beneath and forward of the beater, or other working cylinder, which acts upon the cotton, or other fibrous substance, as it passes between suitable feed rolls, to open the cotton and liberate the seed, leaf, and other refuse matter from the perfect fibre, and force the former through the rack or racks into the seed and leaf chambers below. The invention also consists in the use of a fender, placed so as to intervene between the seed rack and the throat or beneath the seed rack, and in contact with the lower slat thereof, so as to prevent the seeds (which have been forced through the seed rack or between the slats) from being drawn back again by the strong current of air generated by the draught fan, which draws the dust out of the machina.—Patent completed.



3649 A. V. NEWTON, Chancery-lane. Receivering mail bags, &c. (A communication). Receiving and de-lon). Dated No-

3649 A. V. NEWTON, Chancery-lane. Receiving and delivering mail bags, &c. (A communication). Dated November 30, 1868.

The object of this invention is automatically to receive and deliver in an efficient and safe manner mail bags and packages on railways into and from a carriage or carriages while in motion. To this end a scoop is arranged to swing on a vertical axis, within or through an opening made in the side of the carriage, so that when set to a working position it stands obliquely to the side thereof, and operates in connection with suitable devices for suspending the bags or packages, to be received and delivered in such manner that the receiving of the one bag or package by the interior of the scoop, catching and guiding it into the carriage, is or may be made to effect the delivery of another bag or package from the carriage. —Patent completed.

3650 A. RANSOME, Chelsea. Circular saw benches. Dated

3650 A. RANSOME, Chelsea. Circular saw benches. Dated

pactage from the carriage.—Fatent completed.

3850 A. RANSOME, Chelsea. Circular saw benches. Dated November 30, 1863

This consists in a table, on which the timber is laid, and in a circular saw, mounted as usual on a cross shaft, which at its outer end carries the driving pulleys and the grooved cone pulley, whereby motion is communicated by means of a band to the grooved cone pulley of the gearing for feeding forward the timber. This gearing consists mainly in a transverse vertical drum, around which passes one end of a rope or chain, whereby the timber is drawn forward on the table up to the saw. Within the drum ring of teeth is formed, into which gears a pinion keyed on a short longitudinal shaft. This shaft is supported in suitable bearings within the framing, and it carries a loose worm wheel, provided on one;side with clutch teeth. Into these clutch teeth the inventor takes a sliding clutch, which is carried by the short longitudinal shaft, and works over a feather on that shaft, so that it may be thrown in and out of action by means of a forked rock lever, connected by a rod with a hand lever at the opposite and feeding end of the machine. A worm on a cross shaft gears into the worm wheel on the longitudinal shaft, and upon this cross shaft is also keyed a grooved pulley with several speeds. This pulley is driven by the band from the grooved pulley on the saw shaft, which, as already explained, is the driving shaft of the machine.—Patent completed.

3651 J. H. JOHNSON, Lincoln's Inn-fields. Imitation

3651 J. H. JOHNSON, Lincoln's Inn-fields. Imitation and ivery, and stone. (A communication). Dated No.

3651 J. H. JOHNSON, Lincoln's Inn-fields. Imitation secod, torry, and stone. (A communication). Dated November 30, 1568.

This consists in grinding to a fine flock any dry fibrous material, to which flock gum shellac, or other fusible adhesive material reduced to a fine dust or powder, is to be thoroughly mixed, in the proportions of about equal parts, by weight, of each when the greatest strength is required, but these proportions may be varied for different articles, and they may be supplemented by white lead, or other substance, so as to increase or reduce the specific gravity, or by various pigments, for the purpose of colouring. A sufficient quantity of the compound or mixture for the required article is placed in a mould, the temperature of which is sufficiently elevated to fuse the gum, whereupon the said compound is subjected to pressure whilst in the mould, which pressure is maintained till the article is cold.—Patent abandoned.

3652 H. A. BONNEVILLE, Paris. Mineral teeth. (A com-

article is cold.—Tateint abandoned.

3652 H. A. Bonneville, Paris. Mineral teeth. (A communication). Dated December 1, 1868.

Each tooth is furnished with a hollow of a size exceeding that of the orifice through the teeth, by which orifice the rubber, in its plastic state, enters into the tooth, assuming, inside the internal configuration and outside, as it were, the shape of a nail head of a pyramidial form, or of the form of a flattened cone, and the rubber being properly vulcanized, the tooth becomes firmly attached to the dental piece, the hole being obtained by placing on the rear side of the tooth, which is moulded of materials well known to tooth manufacturers, a base or piece of wood, or any other material, cut into the shape of a cone, and fusible at a lower degree of temperature than that required for the tooth, the said piece of wood, or other material, being consumed or done away with during the process of biscuiting, there remains in the centre of the tooth a hollow, corresponding in size and shape with the base which has disappeared.—Patent completed.

3653 W. Betts, Wharf-road. Capsules. Dated Decem-

3653 W. BETTS, Wharf-road. Capsules. Dated Decem

3658 W. BETTS, Whati-local Copyrights in the stamping or embossing, either in relief or in intaglio, is produced on the cylindrical or conical surface of the side of the capsule. Capsules so embossed will constitute a novelty or specialty in themselves, by reason of the practical difficulties which have thinkerto stood in the way of such system of embossing.—

3654 W. BROOKES, Chancery-lane. Lace machinery A communication). Dated December 1, 1863.

3634 W. BROKES, Chancery-lane. Lace machinery.
(A communication). Dated December 1, 1868.

The object of the invention is the manufacture of fabric in lace machinery with fine muslin, or fining portions therein whilst the mesh or net portion thereof is comparatively large or coarse. For this purpose every other stump is taken out of its bar, togother with helf of the warp threads, but all the bobbin threads are kept at work as in full gauge. By these means the fabric is produced by the use of stump bars instead of by independent bars.

—Patent abandoned.

3655 J. B. SHILLCOCK, Bromley. Bottles, jars, &c. Dated December 1, 1868.

The inventor forms the necks of bottles, jars, and other similar vessels, with projections at the sides, and fits thereto an elastic band or binder of wire, or other suitable material, which turns down and passes over the cork or stopper when inserted in its place; and in the stopper, cork, or cover he also forms a groove or notch to keep the band or binder in position.—Patent abandoned.

keep the band or binder in position.—Patent abandoned, 3656 S. A. DANIELL, Birmingham. Cleaning bottles. (A communication). Dated December 1, 1868.

A horizontal axis mounted on a frame has at one end a winch by which a rotary motion may be communicated to it, and at its other end a circular disc or plate. A series of six or other number of supports for the bottles to be cleaned are fixed at equidistant points on the said disc. These supports are not fixed perpendicular to the disc, so as to lie parallel with the axis, but are so inclined that they cross the axis in directions somewhat similar to the directions of the threads of a quick-threaded screw. Each of these supports has, near its botten, a shallow conical cup in which the bottom of the bottle is supported; near the top end of sach support is a slot in which a bracket carrying a tube or hollow cylinder slides, the said brackets

being capable of being fixed at any required position by means of clamping screws.—Patent abandoned.

3657 E. PRICE, Cheapside. Shirt front and collar. Dated December 1, 18

December 1, 1868.

The laventor proposes to form the shirt front either plain or with pleats, being worn with or without studs, and with a closed front pleat or fold; the neck band is then continued beyond the limits of the collar itself, which is attached thereto in the ordinary manner. Thus the collar is connected at one end with the shirt front, and the other portion of the collar is passed round the back of the neck and brought to the front of the band, to which it is fastened by a stud in the centre of the front and a button or stud at the side or edge of the neck band.—Patent abandoned.

2658 J. H. JOHNSON Lincoln's Inpublika Comition

abandoned.

3658 J. H. JOHNSON, Lincoln's Inn-fields. Carding engines. (A communication). Dated December 1, 1868.
This consists in substituting for the annular intervals or spaces formed by bands of leather which are interposed between the rings of card in the doffing cylinder, thin metal blades having knife edges, and secured parallel to each other and side by side in a metal frame which is fixed to the main frame of the carding engine. These thin blades are disposed nearly vertically in front of the doffing cylinder, and are caused to enter the cards to a depth of about 1-16th of an inch, the length of blade in actual contact with the circumference of the doffer being about 2in. The length of the "doffer" is thus subdivided into as many spaces as may be required without the great loss of working space attendant upon the old system.—Patent completed.

or working space attendant upon the old system.—Patent completed.

3659 H. W. FULLER and J. W. BARNUM, New York, U.S.A. Swing machines. Dated December 1, 1868.

The machines constructed according to this invention have a base plate or block to be attached to the bed plate of a sewing machine in a permanent situation thereon with respect to the needle. It is usually so attached by the gauge screw of the machine. Arranged by the side of the base plate is a long plate which is termed the bed plate. This plate is firmly fastened at the back end to a short transverse plate termed a binder. In the binder is fixed a post which passes up through a slot in the base plate and carries a binding nut. In the top of the post, and made fast thereto, is a spring lever carrying one or more of the creasing devices. The devices preferred consist of jaws which pinch or nip the fabric between them, and form a crease on the under side of the fabric by creating a ridge on the top thereof. The modifications thereof consist of a notch and a point or edge arranged on opposite sides of the fabric and crease it by driving a portion thereof into the notch.—Patent completed.

3660 J. GRINDBOD, Chester. Ships. Dated December 1,

3660 J. GRINDROD, Chester. Ships. Dated December 1

1868.
This consists in taking away or opening out as much of the dead surface aft (commonly known as deadwood) as will allow the water to escape or pass through or under, instead of impinging against it, thereby insuring a quick turning of the vessel and a quick helm, and the patentee prefers that there should be little or no gripe forward, or, in other words, that the keel should run up forward.—

Betant completed. in other words, t Patent completed.

Batent completed.

3661 C. S. ROSTAING, Paris. Telegraph cables. Dated December 2, 1868.

To construct these elastic cables the inventor commences by taking a cord or rope of variable diameter, and made of semi-vulcanized india-rubber, of unalterable gutta-percha, of hemp or flax impregnated with a solution of caoutehour, or of gutta-percha, or even made of other materials more or less elastic. This cord or core must be placed in any suitable machine which will give it such a rotary motion that one or more copper wires may be wound spirally upon it. When the elastic cord or core is furnished with the spirals of copper or other metal, they are covered with thin bands or ribbons of india-rubber, or of fabrics prepared with india-rubber freed from efflorences of sulphur by passing sulphure tof carbon or other solvent over their surface, taking care to wind the first band, following the direction of the copper spirals, and that the second layer would be wound in reverse direction to the first. The object of winding the isolating and wire protecting coverings in contrary or alternate directions as above set forth, is to preserve the elasticity of every part of the cable in order that neither traction nor compression may affect any deterioration of the wire.—Patent abandoned.

3662 P. Ellis, Liverpool. Letter box. Dated Decem-1868

ber 2, 1868.

This consists of a letter box so arranged that the letters deposited therein are absolutely safe from all external attempts at abstraction, and a letter bag intended to be attached at the base of the box, so arranged that on removal from the box the opening is closed and the access to the letters by the shutter in the face only, the key of which is in the possession of the owner. The first part of the arrangement is appropriate to residences and chambers, and the whole for post-office collecting pillars, and for those who object to their correspondence passing into the hands of their servants, but receive the bag and open for themselves.—Patent completed.

are reversed, the shortening layers of steel being on the concave. It is proposed so to place these wheels that they sustain the principal part of the load.—Patent completed.

pleted.

3664 J. TIDMARSH, Twickenham. Clipping and shearing.
Dated December 2, 1868.

This consists essentially in the employment of combes, segmental in shape, with the teeth thereof close together, and not radiating from one common centre in combination with a plate, to which a to and fro motion is imparted, also segmental in shape, and carrying cutting blades or teeth (by preference, three), but which do not radiate from a common centre.—Patent completed.

3665 T. WARBURTON, Haslingden. Piecing cotton card-

3665 T. WARBURTON, Haslingden. Piecing cotton cardings. Dated December 2, 1868.

This consists in a method of piecing the cardings, whereby the occurrence of hard places at the points of piecing is prevented. The cardings, instead of being placed singly, as hitherto practised, are pieced double or in pairs (or in groups of three or more), and in such a way that the piecings of each pair of cardings overlap for about an inch. This is effected, principally, by driving the brat at half its usual speed, so that when one set of cardings has advanced about half its length, a second set is delivered from the buckets, and when the first set has advanced in full length, a third set is delivered, with is ends overlapping the first set about an inch and the second about set half way, and so on.—Patent abandoned.

3666 E. HELY, Dublin. Envelopes. Dated December 2,

3666 E. HELY, Dublin. Envelopes. Dated December 2, 1868.

This consists in arranging the various parts of the machine so that they may be made to perform their various functions without the necessity for a continuous driving motion, they being all worked from one foot lever or treadle. This treadle first brings into motion a hammer, causing it to turn over on a pivot or centre, and to emboss the design on the seal flap of the blank by the aid of a fixed die, situate under the hammer face. By this motion of the hammer two appliances may be brought down, if desired, for the purpose of pressing the requisite parts of the blank against the gumming or cementing appliances, after which they, in company with the hammer, are moved back again to their original position, and a plunger of the size of the envelope descends upon the blank and forces it down into a box, sliding like a piston in a cavity in the table of the machine, the four flaps of the envelope being left erect. The continued or further descent of the plunger forces the box still further downwards, and by the action of four folding flappers, which are hinged to the edge of the said box, and are forced inwards by contact with the outer edges of the opening in the metal table, through which the box descends, the erect flaps of the envelope are folded or turned down round or over the edges of the plunger, which completes the folding of the envelope. As the plunger ascends again with the folded envelope. As the plunger ascends as a hereinbefore described for the next envelope, and so on. The peculiar folding action of this machine leaves a thickened edge on the envelope of any desired depth or thickness.—Patent completed.

3667 J. Alexander and J. Hill, Dublin. Railsety

the envelope of any desired depth or thickness.—Patent completed.

3667 J. ALEXANDER and J. Hill, Dublin. Railsey signals. Dated December 2, 1868.

The passage of the locomotive over particular portions of the line is made the motive power for working the signals, either at the extremities of sharp curves, entrances to tunnels or stations, or even along the entire line of railway if required. The inventors arrange on either side of the rail, or of both rails, a bar of iron or steel, presenting a raised curvilinear or segmental surface above the level of the rail, such raised surface receiving contact from the flange or edge of the tyre of the wheels of the engine or train, and becoming thereby depressed to the level of the rails. The rails themselves will not therefore be interfered with, and the engine guard bars will be free to travel over the rails without touching the raised segmental bar. This bar should be from 6ft to 8ft, or thereabouts, in length, and a corresponding depth in the principle of a beam or grider, to resist a lever strain, and is attached at or near one end to a fulcrum or axis, below the level of the rails and at right angles thereto. The ends of the bar are formed with a gradual ascent, each extremity lying well below the surface of the rail, to permit the engine wheels to run smoothly thereon, and to effect a gradual depression from the fulcrum or axis, which then extends completely in a transverse direction under the rails to any extent required, to act on a vertical arm, to which is attached the chain or rope by which the signals are operated; and where required to work along the entire line, what is technically called a dog is made to work into each lever, so as to cause a continuation or succession of signals to operate, so as to affect only those required as the train passes on.—Patent completed.

3668 H. N. MAYNARD, Crumlin. Girders. Dated December 2, 1868.

3668 H. N. MAYNARD, Crumlin. Girders. Dated December 2, 1868.

of the arrangement is appropriate to residences and chambers, and the whole for post-office collecting pillars, and for those who object to their correspondence passing into the hands of their servants, but receive the bag and open for themselves.—Patent completed.

3663 P. Ellis, Liverpool. Omnibus. Dated December 2, 1863.

This consists, first, in an iron frame or carriage, strictly so called, extending from the principal wheels, and thereto secured round the front of the body, and thence projecting to and resting upon the axis of the fore wheels is by means of a vertical bar accurate into the swan neck, and extending into the socket of the axis, the socket as formed as to admit free motion in the vertical bar. Secured upon a plate are two springs, one on each side of the vertical bar. The ends of these springs are connected by appropriate couplings with the axis of the fore wheels; thus in traction no force is in operation on the springs but wholly on the vertical bar. The ends of the sax of the sum of th



3669 S. C. LISTER, Manningham. Weaving. Dated December 2, 1868.

The inventor ties in the pile loops, each with one shoot of weit only, or two may be used, but he prefers one. This enables him to use a coarser weit, and at the same time to obtain a richer pile, whilst, at the same time, by well filling the cloths with weft, as firm a tie is obtained as heretofore. Each pile warp thread may be caught into the cloths by every shoot of the weft in each cloth, but it is preferred to divide the warps into two parts, which in each cloth are caught alternately by the successive shoots of weft. In this way a more regular covering of the cloths by the pile is obtained.—Patent completed.

3670 S. PALLANT. Recent-streat. Fastenings for stars.

the cloths by the pile is obtained.—Patent completed.

3670 S. PALLANT, Regent-street. Fastenings for stays, &c. Dated December 2, 1883.

The inventor fixes on to one of the two edges to be fastened a stiffener of thin steel or other suitable material, having upon it at distances apart a number of stude or hooks, or such like appliances, and on to the other edge he attaches another stiffener, with hooks or similar fasteners upon it, which last mentioned stiffener is jointed opposite each of the hooks or fasteners which it carries, so that by bending the jointed stiffener at each of its joints in succession, each hook or fastener as brought into such a position that it can be passed behind the corresponding stud or hook or such like appliance on the other fastener, and as each joint is straightened its hook or fastener assumes such a position that it is unable to pass back from behind the stud or appliance on which it has been made to catch, and so the parts are securely connected together. At the end or ends of the stiffeners they are held together by a stud and eye, or by other convenient means, which will hold them together and prevent motion longitudinally.—Patent completed.

2671 J. B. Hubbell, Euston-square. Reflectors. (A com-

3671 J. H. HUMBELL, Euston-square. Reflectors. (A communication). Dated December 2, 1868.

This consists in a metal shield or reflector, made bright on its under side and pierced at the centre to allow of the flame of the lamp passing up through it. It is fitted to the argend or other burner, and by means of a pinion in gear with a rack connected with the reflector it is made capable of vertical ediasteron upstifucion to the thorum flame. of vertical adjustment relatively to the lamp flame.-Patent abandoned.

abandoned.

3672 P. Hooker, Old-street-road. Brickmaking. Dated December 2, 1868.

The inventor employs an ordinary punching press to mould and press the bricks, and the improvements consist in providing means for removing the mould from under the plunger of the press after it has compressed a brick within said mould, and of removing the brick therefrom. To effect this he provides a slide at one side of the machine, working in gfdes fixed on the table, and operated by a hand lever and connecting rod, by means of which the mould is moved from under the plunger of the machine to the point of delivery after the latter has compressed a brick therein.—Patent completed.

3673 A. M. CLARK, Chancery-lane. Paving blocks. (A

3673 A. M. CLARK, Chancery-lane. Paving blocks. (A communication). Dated December 2, 1868.

This comprises, first, mineralizing the wood paving blocks; second, an improved concrete; third, an improved waterproof coating; fourth, an improved adhesive mastic; fifth, an improved mineral giue; and sixth, an improved solid glue.—Patont completed.

solid glue.—Patont completed.

3674 E.W. P. TAUNTON, Birmingham. Chairs. (A communication). Dated December 2, 1868.

This consists in applying a spring to each of the front legs of chairs in the manner hereinafter explained. This spring is interposed between the bottom of the leg of the chair and the floor, whereby the front of the chair is raised. The gentle inclination of the body backwards and forwards occasions an alternate compression and relaxation of the springs, and, consequently, a rocking motion in the chair.—Patent abandoned.

in the chair.—Patent abandoned.

3675 D. Dorrity, France. Locking printers' formes.

Dated December 3, 1868.

In constructing this improved locking apparatus or mechanical furniture, the inventor provides a metal frame, by preference oblong, and he fits into its centre a vertical pinion, the teeth of which being of helical or spiral shape, he causes to gear into those of two adjacent horizontal toothed wheels or endless screws, one on each side of the pinion, and each of these gearing into another wheel or serow of the same description, and likewise furnished with teeth or threads of appropriate shape, and the whole of this gear may be mounted or fitted into the aforesaid frame or casing by means of axles, or in any other manner. The toothed wheels or endless screws being made hollow, he so fits a screw of a smaller diameter into each of them as to cause these wheels to form the nuts or female screws of the (male) screws or tapered spindles, so that each of as to cause these wheels to form the nuts or female screws of the (male) screws or tapered spindles, so that each of these will proceed out of or recede into its nut according to the direction in which the latter revolves, the two inside spindles moving in one direction whilst the two outside ones move in another. To the outer ends of every pair of spindles he fits a thin metal plate corresponding in width and shape to the outer surfaces of the frame or casing of the apparatus, so that one plate may connect the two outside and another on the opposite side of the frame the two inside spindles with each other.—Patent completed.

2676 I. J. Marguar. Bishopsgetestreet Without

completed.

3676 L. J. MARBCHAL, Bishopsgate-street Without.

Safety lock. Dated December 3, 1868.

Instead of the ordinary key, the inventor uses a special stock furnished with bits or teeth of different lengths according to the interior combinations of the lock, so as to permit of the free movement of the bolt or bolt and latch. The action of the teeth or bits by pressure places upon an equal line a series of slots cut in many movable blades in proportion to the numbers and lengths of the different bits or teeth, so as to permit of a free passage within these slots of a comb fastened on to the bolt, which comb in any other position of the blades is immovable.—Patent completed.

3677 H. W. GRYLLS. Great St. Helen's. Motive power.

3677 H. W. GRYLLS, Great St. Helen's. Motive power. Dated December 3, 1868.

Dated December 3, 1868.

The inventor makes a metal or wood frame to which he fixes a shaft, on the frame of which is fixed a cog wheel which gears with the cogwheel on the flywheel. A spring or springs is or are fixed on this latter shaft, which has also a ratchet wheel and a catch to check the action of the springs when required. He also places on this shaft one or more large wheels fastened to a disc or discs or iron plate for gearing into the wheel or wheels on the second shaft or axle for driving machinery or fans or other appliances that may require to be driven. To obtain in anchors.

great power, he uses two shafts instead of one only. He then uses large drum springs fixed on a cylinder or cylinders, on the sides of each of which he fixes a disc, and fastens the same together by bolts and nuts, and thus encloses the spring or springs; at the side of the disc is a slot to receive a sliding her attached to the spring to keep it from breaking when winding. On the side of each disc he places one or more wheels for driving as may be required, which gear with wheels on the second shaft or axle; the whole of this mechanism is fixed on the first stated shaft.—Patent abandoned.

3678 W. Pugh and J. FIELD, Bow-street. Lenses. Dated December 3, 1868

December 3, 1868.

This consists in the employment of two glasses or pebbles, one placed on the other, and secured together. Supposing a 2-inch tinted concave lens is required, a shell of tinted gluss neutral, before being cemented and ourved on one side of the lens, is taken, into which the second lens is balsamed or otherwise fixed. An equal tint is thus maintained throughout, no matter what focus may be desired.—Patent abandoned.

thus maintained throughout, no matter what focus may be desired.—Patent abandoned.

3679 W. E. Geder, Strand. Ploughs. (A communication). Dated December 3, 1868.

This consists in certain modifications of the share and mould board, in the application to the beam and combined stays, props or body, of a socket piece of turn wings, and of a share forming a Grecian plough, and to this same socket of a small share to form a grubber. The beam is of wood, with two plough handles or levers fixed by two bolts and nuts, the sole or slade, and body or stays, forming a single piece; the two props have at the top two beans, which enter the wooden beam, and are there finally fixed by two strong bolts and nuts. The sole carries a pivot front and back. The front pivot enters into a hole made under the fore part of the mould board, and a hole at the back receives the second pivot, which is at the extremity of a support or buttress having two branches. At the other end, and at the extremity of each of these branches, is a cramp iron which hooks the mould board by means of two fixed catch holes or staples. A rod held by one end fixed to a hole in the mould board, enters the hole placed in front of the spring of the branches of the buttress, and is there fixed by a nut; it is this rod which keeps the entire arrangement in position.—Patent abandoned.

3680 J. H. BANKS, Knutsford. Building. Dated Decembers 1888.

3680 J. H. BANKS, Knutsford. Building. Dated Decem-

ber 3, 1868.

By the use of iron buttress standards placed at defined distances apart, the inventor nearly relieves the walls of the weight and thrust. These standards have flanges formed upon them so arranged that the spaces between one standard and another can be filled in with boarding bricks and bond timber, rubble and bond timber, or any other material, as may be desired; also upon the upper extremity of the standards a shoe is formed to receive the end of roof principals. One side of the shoe is formed of a separate plate, which manner of construction allows the woodwork to be bolted tightly up to the side of the shoe, which is a part and parcel of the principal.—Patent abandoned.

3691 J. LITTLER and J. H. BANKS, Knutsford. Furnaces and December 3, 1868.

asal J. LITTLEE and J. H. BARKS, RIUGSTOTA. Furnaces, Dated December 3, 1868.
Ordinary furnaces consist of one chamber. By this invention, the chamber is to a certain degree partially divided, according to circumstances, in the following manner:—First, in the case of furnaces of salt pans, which are generally very broad and short, and others of similar construction and proportion (such as are used for the purpose of baking, heating, boiling, and melting, not being furnaces for the generation of steam) at any defined distance between what is commonly termed the bridge and the door, one or more partial divisions are made transversely, which divisions depend down from the upper surface of furnace to within any distance from the firebars, which may be found desirable according to the magnitude and nature of the furnace.—Patent completed.

3832 C. H. CHABBURN, Liverpool. Drawing instrument,

which may be found desirable according to the magnitude and nature of the furnace.—Patent completed.

8632 C. H. CHADBURN, Liverpool. Drawing instrument.
Dated December 3, 1868.

This instrument is called the "catholograph," and it consists of a pair of cross levers working on a fixed axis, in or near the centre of their length. The ends of these levers or beams are connected at each end by a pair of link or connecting rods, jointed together at one end, and to the extremities of the cross levers at the other, so as to form two sections, constructed on the lazy tongs principle. The axis or fixed centre upon which the cross levers work is formed with a clamp or other suitable means of attachment, for fixing the same to a drawing board, drawing block, or a frame on which the paper, canvas or other material to receive the drawing or sketch is intended, and which is placed in a vertical or nearly vertical position when the instrument is being operated with. A pencil or other tracing point is fitted to one of the connecting rods on the lower end of the cross levers, so as to be in front of the paper or other material which is to receive the drawing.—Patent completed.

3683 R. HORNSEY and J. E. PHILLIPS, Grantham. Mos-

ing.—Patent completed.

3683 R. HORNSBY and J. E. PHILLIPS, Grantham. Mousing. Dated December 3, 1868.

In reaping machines, in which the crop is delivered at the side of the platform in a continuous swathe, there is necessarily the weight of the delivering apparatus on the platform of the machine, and it is desirable to counterbalance this weight, by placing the other weights on the other side of the main carrying wheel. The inventors, therefore, mount the whole of the driving gear of such machines, so that it is carried entirely by a single frame on the outer side of the main carrying wheel. The frame is, by preference, formed of top and bottom bars of wrought iron, with cast iron distance blocks between them.—Patent completed.

#### APPLICATIONS FOR LETTERS PATENT

Dated June 8, 1869.

1765 A. Williams, Bankside, Southwark, Surrey. Improvements in gas stoves for cooking purposes.

1766 B. J. B. Mills, Southampton-buildings, Middlesex. Improvements in obtaining lithographic compositions or printing surfaces.

1767 H. Carter and G. H. Edwards, Bow, Middlesex. Improvements in breech-loading firearms known as Chassepot rifies.

1768 D. Cole, Bitterne, Southampton, Improvements in anchors.

1769 M. Michel, Edinburgh. Improvements in aerial navigation, and in apparatus employed therefor.
1770 fA. Gardiner, Manchester. Improved means of checking the receipts of omnibus guards, conductors of public vehicles, and other persons employed as money takers.

kers. 1771 W. Cubley, Newark, Nottinghamshire. Improvements in drawing boards.
1772 A. M. Clark, Chancery-lane. Improvements in machinery for propelling vessels.

machinery for propelling vessels.

Dated June 9, 1869.

1773 V. J. Four, Marseille, France. An improved case or box for containing matches or other articles.

1774 W. E. Gedge, Wellington-street, Strand. An improved machine or apparatus for treating leather to render it suitable for making straps, belts, or bands.

1775 R. Roberts, Haulgh, Little Bolton, Lancashire., Improvements in mechanical and artificial dentistry.

1776 D. J. Field, Auborn House, Ashton-on-Mersey, Chester, and I. W. Lister, Welliadd, Rochdale. Improvements in machines for compressing wool or other substances.

ments in machines for compressions.

1777 J. Mabson, Norwood, Surrey. Improvements in, and connected with, sewing machines, the production of new stitches or new work in sewing machines, and the combination with sewing machines of a certain other description of machine.

1778 A. J. Billing, White Lion-street, Chelsea, Middlesex. Improvements in roller blind furniture.

1779 W. Madders and J. Wood, Manchester. Improvements in machinery for embroidering.

1780 J.T. Twigge, Edinburgh. Improvements in velocipedes.

1781 H. W. Hammond, Manchester. Improvements in

pedes.

1781 H. W. Hammond, Manchester. Improvements in hammers for forging metals and for other purposes, and in the mode of actuating the same.

1782 A. St. C. Badisson, Lyons, France. Improvements in the treatment of oleine and other fatty matters for the purpose of transforming them into solid materials suitable for the manufacture of candles.

1783 E. Bishop, Steffield. Improvements in shears, specially applicable to those used for sheap shearing.

1784 N. R. Hall, Rusherville, Kant. Improvements in apparatus for weighing letters and other articles.

1785 W. L. Wise, Chandos Chambers, Addiphl, Westminster. Improvements in the manufacture of artiticial fuel, and in apparatus for the purpose.

1786 W. Chambers, United University Club, Middlesex. Improvements in refrigerating and ventilating carriages, trucks, or other movable or fixed apparatus used for conveying or storing animal or vegetable substances of a perishable mature.

1787 G. Johnson, Coventry, Warwickshire. Improvements in looms for weaving ribbons, trimmings, and frillings.

ments in looms for weaving months, in looms, frillings.

1788 R. Harrison, Port Madoc, Carnarvonshire. Improvements in machinery or apparatus for squaring or dressing roofing slates and counting and registering the same, and loading the slates on to waggous or trucks, part of which improvements is also applicable to sawing machines for wood.

Dated June 10, 1869.

of which improvements is also applicable to sawing machines for wood.

Dated June 10, 1869.

1789 C. Denbeigh, Ironmouger-lane, Cheapside, City, Improvements in the construction of velocipedes, and in the manner of driving and guiding them.

1790 G. Fry, Ethelburga House, Bishopsgate-street Within, Middlesex. Improvements in the treatment of wood for obtaining fibre for the manufacture of paper and cordage, also for the production of acid, spirit, ether, rosin, and other substances or liquids from wood.

1791 G. Bedeil, Liverpool. An improved apparatus for readjusting railway locomotives, carriages, and other rolling stock thrown of ithe metals of railways and tramways.

1792 J. Blair, Caledon Mills, Manchester. Improvements in the manufacture of wadding.

1793 T. Riley, Shoreditch, Middlesex. Improvements in the manufacture of wire cloth or gauze used in the manufacture of wire cloth or gauze used in the manufacture of paper and other similar purposes.

1795 T. Foster and J. Hollinrake, Bury, Lancashire. Improvements in apparatus for the prevention of emoke in furnaces.

1796 W. Cook, Aberdeen Park, Highbury, Middlesex. Improvements in apparatus for taking photographic discontinuations and the descriptions of taking photographic discontinuance of the prevention of emoke in apparatus for taking photographic discontinuance of the prevention of emoke in apparatus for taking photographic discontinuance of the prevention of the prevention of taking photographic disc

in furnaces.

1796 W. Cook, Aberdeen Park, Highbury, Middlesex. Improvements in apparatus for taking photographic pictures by which the operator can take a number of prepared sensitive plates and expose them successively without the aid of extra changing box or bag.

1797 W. R. Lake, Southampton-buildings, Chancerylane. An improved covering for floors and other surfaces.

1798 W. A. Glibee, South-street, Finsbury, Middlesex. An improved method of conveyance and transportation in pneumatic tubes.

pneumatic tubes.
1799 J. G. Marshall, Leeds. Improvements in veloci-

pedes. 1800 G. W. Oliver, Liverpool. Improvements in the manufacture of explosive powder, and in machinery to be used in such manufacture.

Dated June 11, 1869.

1801 W. A. Lyttle, The Grove, Hammersmith, Middle-ex. Improvements in electro-telegraphic apparatus.

1802 E. T. Hughes, Chancery-lane. Improvements in awa or other similar instruments for cutting and dress-

saws or other similar instantiation.

1803 A. A. Ardisson, Boulevart Magenta, Paris. An improved appearatus for stopping horses when they run away or become unmanageable.

1804 W. E. Newton, Chancery-lane. Improvements in submarine drilling appearatus.

1805 C. Stuart and W. Walker, Manchester. Improvements in apparatus for expauding the ends of boiler and other tubes, and also for plugging the same when required.

Dated June 12, 1869. 1806 J. Hill, Wolverhampton, Staffordshire. Improvements in furnaces for steam boilers and for other pur-

poses, 1807 B. Duckworth, W. Greenwood, J. Pearson, and J. Langtree, Blackburn, Lancashire. Improved apparatus or appliances to be employed for sizeing and warping yarns

and for weaving.

1803 R. Wilson, Blackburn, Lancashire. Improved fasteners for neckties.

1809 A. La argue, Park-road, Newcastle-on-Tyne. Im-

provements in apparatus for weighing and registering.

1810 J. H. Riddell, Cheapside, City. Improvements in joints or connections for uniting and securing together the ends of pipes or tubes.



1811 G. W. Howe, Regent-street. An improved construction of steam gauge.

1812 J. H. Brown, Abbey Mills, Romsey, Hants. Improvements in the manufacture of helmets, hats, caps, and similar articles, and in the apparatus and arrangement thereof.

and similar articles, and in the apparatus and arrangement thereof.

Dated June 14, 1869.

1813 C. Mather, Salford Iron Works, Manchester. Improvements in machinery for ginning, burring, and cleaning cotton and other fibrous substances.

1814 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in sewing machines, chiefly designed for sewing the outer soles to the welts of boots and shoes.

1815 L. H. Dennis, Birkenhead, Chester. An improved apparatus for cutting or dividing glass.

1816 E. G. Brewer, Chancery-lane. Improvements in connecting pipes or tubes.

1817 R. Brown, Glasgow. Improvements in the manufacture of iron.

1818 J. Taylor, Russell-street, Bermondsey-street, S.E. A floating and sliding top for wells, tanks, cisterns, or any other kind of vessel for keeping or holding water, fermented or untermented, or any other kind of liquor.

1819 W. S. Underhill, Newport, Salop, and J. Smith, Church Aston, Edgmond, Salop. Improvements in reaping and mowing machines.

1820 W. E. Newton, Chancery-lane. An improved attachment for, and mode of, actuating ships' pumps.

1821 J. Young, Houghton-le-Spring, Durham. An improvement in the silde valves of steam engines.

1822 J. G. Tongue, Southampton-buildings, Chancerylane. Improvements in shuttles for weaving.

1824 D. Fitzgerald, New York, U.S.A. Firing pro-

shoes.

1824 D. Fitzgerald, New York, U.S.A. Firing projectiles from a cannon or mortar which is attached to a vessel, and which is termed a submarine cannon or

PROVISIONAL PROTEOTION FOR SIX MONTHS
Has been granted upon Specifications bearing the following numbers:—

329 1145 1305 1371 1449 1451 1496 1502 1523	1579 1616 1617 1620 1628 1629 1632 1633	1636 1637 1639 1640 1642 1643 1644 1646	1650 1651 1652 1653 1654 1655 1656 1658	1662 1663 1664 1665 1666 1667 1668 1669	1672 1673 1674 1676 1677 1678 1681 1684 1685	1687 1688 1689 1690 1691 1692 1693 1695	1700 1701 1703 1704 1705 1706 1707 1708 1709
1528 1537 1572	1634 1635	1648 1649	1659 1660	1670 1671	1685 1686	1696 1699	1709 1710

# NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London G	azette," June 15, 1869.
319 W. A. Smith 325 J. Slater	637 J. Townsend and F Forbes
329 A. S. and A. R.	746 J. and A. Wadding
Stocker	ton and F. Bell
335 R. R. Frohock	887 F. de Bowens
347 R. W. Knowles and	928 N. Voice
G. Green	942 E. Morewood
348 J. Vavasseur	975 B., H., and J. N
353 G. and E. Ashworth	Oraven
360 J. Taylor	988 J. B. Rowcliffe
373 J. T. Edmonds	1034 G. T. Bousfield
374 H. A. Bonneville	1075 G. D. Hughes and A
378 B. Walker and W.	H. Sellers
Tilson	1119 J. Easton 1209 W. E. Gedge
380 T. Nichols and J. Parr	1209 W. E. Gedge
383 R. W. Row	1292 W. Prowett
395 J. and G. W. Den-	1309 N. Voice 1317 A. Meredith
nell	1336 H. J. Seels
396 J. Wilkinson and W.	1854 J. Shackleton
Scott	1392 J. Tolson
401 G. F. G. Desvignes	1427 W. E. Newton
404 J. H. Johnson	1469 J. Townsend and P.
407 G. Gros	Forbes
408 W. Hilton	1516 C. Moseley
420 J. Clayton	1539 W. R. Lake
423 J. Carter	1567 W. R. Lake
442 W. E. Newton	1575 C. W. Siemens
451 E. G. Brewer ;	1577 W. R. Lake
458 W. Basford	1589 S. Thomas
468 W. Smartt	1613 W. Palliser
496 J. D. Nichol and J.	1620 J. J. Field
Eckersley	1630 A. Edlmann
514 S. Myers	1642 J. Bronner and H.
549 J. E. Liller	Gutzkow
558 A. Jobson	1649 T. Clarke
577 J. T. Griffin 582 B. P. Walker	1686 T. R. Clarke, W.
082 B. P. Walker	Bywater, T. Law-
615 R. S. Norris	son, and C. L.
620 R. J. Goodbody and R. E. Donovan	Lister 1711 C. Ostlund
628 J. Hadley	1711 O. Osnana
The full titles of the paten	ts in the above list can be

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Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

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	HA1 1 1111/1
1594 T. J. Leigh 1596 P. H. Limet 1601 G. D. Kittoe 1616 J. Carter 1618 W. Bellhouse 1620 B. E. Hodges	1629 J. G. Marshall 1630 W. Robertson and J. G. Orchar 1679 P. Barlow 1707 H. Medlock and W. Bailey

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1738 W. Holland

#### LIST OF SEALED PATENTS. Sealed June 11, 1869.

3778 C. Ellison and E.	) 3855 J. Hoagson, н. в
Parkinson	tomley, and E. Coo
3783 G. Preston and J.	roft
Prestige	3869 M. S. Maynard a
3791 W. Meakin	B. Grime
3798 J. Thomas	3870 P. Spence
3805 H. Williamson	3905 G. Tidcombe
3806 A. Baumann	8937 H. C. M. Turnbull
3815 P. Kotzo	3942 W. Ehrhardt
3820 W. Cotton and E.	1086 W. W. and J.
Attenborough	Hooper
3825 T. C. Fidler	1093 S. F. V. Choate
8837 G. Hadfield	1178 G. T. Bousfield
3845 F. H. Knevitt and	1194 H. A. Bonneville
H. H. Hazard	

Sealed June	e 15, 1869.
3833 G. Ritchie	3913 W. Clay
3847 R. Hallimond	3929 A. M. Člark
3849 J. Pouncy	3955 L Pick
3850 C. Liebermann and	3968 J. H. Johnson
C. Graebe	20 S. J. Peet
3853 J. W. Brierley	34 D. Nicoll
3856 E. S. Griffiths	57 W. Tatham
3857 T. B. Salter and J.	105 W. R. Lake
Silvester	163 J. H. Johnson
3859 S. Remington	762 H. J. B. Kendall
3864 E. Pavy and J. Clark	957 W. F. Proctor
3873 J. Dickson	1016 S. Sharrock
3874 G. H. Asker	1083 J. Dewar
3898 G. Ritchie	1245 W. R. Lake
3908 S. Smart	

#### OF SPECIFICATIONS PUBLISHED For the week ending June 12, 1869.

No.	Pr.		Йo.		F	r.	N	0.	I	Pr.	N	0.	P	r.	N	0.	E	r.	N	0.	P	r.
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8044	0	10	32	251	1	10	32	91	0	10	33	44	0	4	33	58	0	10	33	84	0	8
3093	3	0	32	259	0	10	32	96	1	0	38	45	1	. 0	33	63	1	4	33	85	0	4
3128	3	6	32	260	0	8	32	98	1	4	33	46	0	4	33	64	0	4	38	91	0	4
3146	9	10	35	262	0	8	33	08	0	8	33	47	0	8	88	66	0	. 4	33	92	0	8
3187	0	10	35	274	0	8	33	16	2	6	33	48	10	4	33	67	0	4	88	93	0	6
3196	li	2	35	276	0	10	33	28	ı	0	133	49	ю	4	33	68	0	.4	33	95	0	4
8205	2	6	35	278	2	2	33	31	0	8	133	51	0	4	33	73	0	4	38	98	0	4
3210	ī	0	35	280	1	6	33	37	0	4	33	53	o	10	133	74	0	8	34	03	0	8
3237	lō	10	39	286	Ō.	8	38	40	0	4	133	54	Ó	4	33	75	0	10	34	36	0	10
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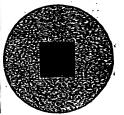
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THE

#### MECHANICS' MAGAZINE.

LONDON: FRIDAY, JUNE 25, 1869,

#### THE PROPOSED FARADAY MEMORIAL.

THE proposition to provide a public memorial to the memory of the late Pro-fessor Faraday, assumed a practical form on Monday last, when a meeting was held at the Royal Institution, at which the Prince of Wales presided; the object being to promote the matter in question. There was a goodly the matter in question. There was a goodly gathering of scientific men, including Professors Playfair, Owen, and Tyndall, Sir Henry Holland, M. Dumas, Sir Roderick Murchison, Dr. Billing, &c. From the opening remarks of the Prince of Wales, it appears that early in 1868 the council of the Royal Society requested their president to take measures for bringing forward a proposal for a memorial to Faraday, and it was forwarded to the following societies, with a request that they would join with them in the endeavour to carry out that object, namely:—The Royal Institution, the Royal Geographical Society, the Royal Chemical Society, the Geological Society, the Royal Astronomical Society, the Linnæan Society, and the British Associa-Linnæan Society, and the British Associa-tion. On the 24th of March, 1868, a meeting of the eight presidents of the Royal affiliated societies was held, and it was thought desirable by them to learn the views of the Government in record to the the views of the Government in regard to the erection of a monument to Faraday. On the 27th of June, 1868, Mr. Disraeli asked his secretary to write to the effect that he considered the erection of a monument to Professor Faraday to be a proper object to which to devote public funds; but that as the esti-mates for the year had passed, any vote for the purpose must be deferred to the following year. On the 8th of May, 1869, the present Chancellor of the Exchequer wrote that, chancellor of the Exchequer wrote that, while fully concurring in the propriety of erecting a monument as proposed, he could not, as Chancellor of the Exchequer, consent to the appropriation of public money for the erection of a monument to any private citizen, however eminent; adding that "he did not be the other than the found in the country to th not make that rule, but found it." 8th of June, it was resolved that a meeting should be held at the Royal Institution, which is the meeting in question.

General Sabine, in a few appropriate re-

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marks, moved the first resolution, which was "that it is desirable that measures should be taken to provide a public memorial to Faraday." The motion was seconded by M. Dumas, who highly culogized the talents and learning of the late professor. The motion having been put and carried unanimously, Sir Henry Holland moved, and Sir R. Murchison seconded, a resolution, "That a committee be appointed to take the necessary measures for the provision of a public memorial." This resolution having also been carried, Professor Owen moved, "That a public subscription be entered into, the subscriptions not to exceed five guineas in each case, in order to raise the requisite funds."
Professor Playfair seconded the motion which was also carried. After this, Sir Henry Holland moved a cordial vote of thanks to His Royal Highness, for his conduct in the chair. Professor Tyndall seconded the resowho, in thanking the meeting, gave his assurance that if anything more could be done in the matter by him, he would always be at their service. We trust that now the matter has been set fairly afloat, the necessary machinery will be organized, and the necessary funds collected, by which honour will be done to the memory of one whose name occupies so distinguished a position amongst terial, Mr. Fletcher suggests that the plates used in the construction of boilers should not only be branded or stamped, like silver, with a certificate of quality, but marked also with the name of the manufacturer, so that the responsibility of the work could always be brought home to him. Then, with regard to the fittings, we all know how easy it is to intainted. Perhaps, as a rule, little more that can be made. It is open to the consumer to adopt the same means of obtaining the greatest amount of light possible from the gas supplied to him. How much light is brought home to him. Then, with regard to the fittings, we all know how easy it is to intainted. Perhaps, as a rule, little more that can be made. It is open to the consumer to adopt the same means of obtaining the greatest amount of light possible from the responsibility of the work could always be brought home to him. Then, with regard to the fittings, we all know how easy it is to intainted. Perhaps, as a rule, little more that can be made. It is open to the consumers to adopt the same means of obtaining the greatest amount of light can be made. It is open to the can be made. It is open lution, which was responded to by the Prince,

those of scientific men. For our own part, we shall be happy to place our journal at the service of the committee when formed, with the view of promoting an object in which all classes of society cannot fail to take an interest.

#### THE BINGLEY EXPLOSION

THE fatal boiler explosion at Bingley, which caused the death of fifteen persons, and injured about twenty-five more, has been the subject of investigation by Mr. L. E. Fletcher, Engineer-in-Chief to the Manchester Steam Users' Association. The examination was made at the instance of the coroner, who very judiciously adjourned the inquest pending Mr. Fletcher's report. That document has now appeared, and, from a perusal of its contents, it appears to us mira-culous how the boiler lasted so long as it did. It was of the type usually employed in the Lancashire and Yorkshire mills, but was constructed of inferior metal, and so was wrong from the first. Previously to being wrong from the first. Previously to being put to work at Bingley, it had seen some eight or nine years' service in another establishment. When it left the latter place, it was purchased by a boiler maker, repaired, and resold. The repairs were necessitated by external corrosion underneath the boiler, but they were imperfectly done. Half-inch plates were riveted on to the old plates where they had become worn to a quarter of an inch. Thus patched up, the boiler lasted three years, when it exploded with the fatal effects we have mentioned. From an examination of the fragments, Mr. Fletcher found that leakage began at the junction of the old and new work. In more than one place, the plates were found to be reduced to the thickness of a sheet of paper—the old, old story. Of course, the shell gave way here, and the rent proceeding thence through the addiction relates soon completed the dethe adjoining plates, soon completed the destruction of the boiler.

But the piece of patchwork was not the only fault the boiler had; it was badly equipped, and badly tended as well. The safety valve was too small and of defective construction, and the engine tenter is be-lieved to have been both incompetent and reckless—two conditions generally found as-sociated together. Mr. Fletcher, however, very properly observes that some more prac-tical lesson should be drawn from this fatal catastrophe than to throw the onus of fifteen deaths upon an ignorant stoker already killed by the explosion. The jury, however, eturned a verdict of manslaughter against the dead stoker, and censured the owners of the mill for employing so incompetent an attendant and leaving him without supervi-sion. They also recommend that all boilers should be brought under Government inspection, and there the matter rests. But the circumstances attending the construction and use of this boiler call for further remark here. We have over and over again pointed out how really preventible are those explosions, and that, therefore, they do not properly come within the meaning of the term "accident." It is needless to observe that this boiler was not under inspection, or it would have been condemned three years since. Had it been properly constructed at first, and placed under the protective inspections of the companies formed for this purpose, it is highly improbable that the recent catastrophe could have occurred. To guard against the possibility of bad ma-terial, Mr. Fletcher suggests that the plates

Bingley explosion is only a repetition of an oft-told story, which must lead to protective legislation if repeated in the highly culpable form it has here assumed. Such events make us look with anxiety to the work the committee of the Manchester Steam Users' Association have taken in hand, for promoting the security of life and property against unsound boilers. They propose that coroners should be empowered and instructed to command the attendance of competent engineers to give evidence when conducting enquiries in reference to these disasters. This would in reference to these disasters. render unnecessary any Government action, which might prove an interference with the freedom of the steam user, but to which he will inevitably have to submit if he does not mend his ways.

#### THE REPORT OF THE GAS REFEREES.

THE second report of the Gas Referees, just presented to the Board of Trade, deserves a notice, from the insight it gives us into what the referees have been doing. In the first place, they tell us that the testing stations are ready, and that they have caused them to be fitted up with "improved forms of Bunsen's photometer." This means, we read in the "Journal of Gas Lighting," in every instance but one, Mr. Evans' photometer, which very few regard as an improved form of Bunsen's. But we may let that pass. The referees go on to say that they regard our present system of photometry as very defective—the coincidence of which opinion defective—the coincidence of which opinion with that invariably expressed by gas examiners is truly remarkable. But they go on to say, that "a slight variation in the sensibility of the eye of a gas examiner may easily make a difference of half a candle in his recorded testings." That eyes do vary in sensibility must, we suppose, be accepted as a fact, although the thing is difficult to prove. But what the referees do not say is, that an eye is just as likely to be over as under sensitive, and that an error is just as likely to be in excess as the other way. And, likely to be in excess as the other way. And, further, that if we suppose a fatigued eye, the under-sensitiveness will be exhibited as much on one side of the photometer as the other, and thus the result will be just as accurate as if there were no variation in sensibility at all. The object of the paragraph, however, is tolerably evident. It reads like an "instruction" to the Chief Examiner that it would be extremely unjust to fine a gas company for a deficiency of half a candle in illuminating power, and, as such, will no doubt receive its full appreciation. If this variation in the sensibility of the eye be admitted there is of course and to all the sensibility of the eye be admitted there is of course and to all the sensibility of the eye be admitted there is of course and to all the sensibility of the eye be admitted. mitted, there is, of course, an end to all modes of photometry in which the human eye plays any part; and as the referees feel it incumbent on them to discover, if possible, some better means, they must find one which altogether dispenses with the use of this variable organ.

The mode of discovery adopted by the referees is not one usually practised in scien-tific pursuits. It is one, however, by which people often get what they want—namely, by advertising! They advertised for a burner, and "discovered" Mr. Sugg's London argand, which they have adopted as the standard burner. Against this adoption there is nothing to be said. It is, unquestionably, the best burner for common gas yet invented, and the gas companies have a right to be tried by the very best standard

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fective burners they employ. We quote the cause of this, as stated by the referees, which will not be flattering to many of our readers -"With one or two exceptions," they say, "the manufacturers of gas apparatus are wholly ignorant of the principles which regulate the development of light from gas; and, in consequence, the market is filled with bad burners, when good ones might be had quite as cheaply." We recommend the manufacturers of gas apparatus to take this sentence to heart, together with some other statements made by the referees. They tell us of the smaller burners—bat'swings and fishtails—that they are so carelessly made that scarcely any two professedly of the same character will agree in the amount of same character will agree in the amount of light they give; that fish-tails are especially bad, some giving only 24 and 23 of the light they ought to yield. This is a grave but, no doubt, a true statement, the publication of which will, we hope, lead to improvement. It seems clear from this that undeserved blame is often thrown upon gas companies. The public complain of the gas when their burners are at fault. It is quite right of the gas referees to point this out, even if in so doing they step a little out of the track prescribed for them by the Act of Parlia-

But what is the immediate effect of the location of the new standard burner? The adoption of the new standard burner? light given by the old standard, equalling 100, as they say, the new burner with the same gas gives a light equal to 116. In other words, supposing the gas is 14 candles by the old, it will be over 16 candles by the new standard. Thus by a stroke of the pen, as we may say, the referees have at once raised the quality of the gas to the standard which will be required after the 1st of January next. The gas companies ought to be infinitely obliged to them, and still more to Mr. Sugg.

Now, supposing London tolerably lighted with our present gas supply, and the almost universal use of bad burners—and that such is the fact, nobody will deny—every one will agree with the referees, that by the use of good burners "a satisfactory amount of illumination could be secured with an increased use of cannel coal." This is said on page 4, when illuminating power is in question. But when illuminating power is in question. But presently we come to the question of the amount of sulphur to be allowed. This seems likely to be settled by the referees some time in the Greek Kalends. They have cut out an immense amount of work to be done before they can decide on a maximum for sulphur. But having just now said, and, indeed, made it perfectly clear, that gas may be raised two candles in illuminating power, without any additional use of cannel coal, they tell us, on page 8, when sulphur is in question, that this increase of two candles "can only (so far as is yet known) be attained by using cannel coal in larger proportion than at present, and cannel coal usually contains a larger proportion of sulphur compounds than common coal does." After this, we can only expect a liberal allowance of sulphur for the gas com-

It is unnecessary to say much about the modes of estimating sulphur in gas. referees have a perfectly accurate one in Mr. Valentin's process, but it is not very easy to carry out. Dr. Letheby's method has been Dr. Letheby's method has been adopted provisionally, but the referees say that they have convinced themselves by experiment that it does not afford a perfect criterion of the amount of sulphur compounds in gas. This is another remarkable coincidence in opinion, for neither Dr. Letheby nor anybody else has ever said that the process could be relied on as a perfect criterion. However, the referees have devised a process of their own to meet the requirements of the case, which they have submitted to Drs. Odling and Frankland, whose report is waited

for.

The amount of ammonia now allowed is, as

our readers know, five grains in 100 cubic feet. This by weight forms only 1-4000th part of the gas. By combustion, ammonia is converted into nitrous acid, and supposing the 100ft. of gas burnt in a room 20ft. square by 12ft. high, the nitrous acid would form 1-640,000th part of the atmosphere of the room if it remained unventilated. By this state-ment, it is insinuated that five grains of ammonia can do no harm. Nay, the referees say, by some chemists—by whom it is not said—ammonia may do good, since it tends to neutralize the sulphurous acid formed in the combustion of the gas. How nitrous acid neutralizes sulphurous acid it is difficult to see. That it may assist in converting sulphurous acid into sulphuric, and so assist in doing harm, is more than probable. But, indeed, the combustion products of ammonia are of small consequence. It is the mischief done to gas fittings by ammonia itself that makes it so desirable to get rid of it, and we read with some satisfaction that the referees have made up their minds that eventually it shall be got

The general remarks which conclude the report we have read with some astonishment. The referees take credit for having done all in their power to save expense both to the municipal bodies and the gas companies. They wished to have as few testing places as possible; but as the companies insisted on having the tests made as near as possible to the 1,000 yards, the referees acceded. Nobody supposed for a moment that they would do otherwise. But the absurdity of the limitation remains. Gas need not and ought not to lose illuminating power as it travels; and if the companies' mains extend ten miles, the consumer at the end of the distance is entitled to as good gas as another close to the works, for he pays precisely the same for it. Profiting by the example of the gas companies, we may expect that when the next Adulteration Bill comes before a committee, the dairymen will insist on having their milk tested close to the cows' teats, and not at the extremity of their milk walks, for milk often loses in inchange in the control of the company of the compa richness as it travels. And there is evidently some of the milk and water of human kindness in the referees. If they suggest to the corporations that they have made the work of an examiner so simple that he need only be paid a small salary for doing it, they tell the examiner that they have studiously en-deavoured to occupy as little of his time as possible. And yet, mindful as they are of corporations and examiners, they have not forgotten the interests of the companies, and so have put "ample checks upon the gas examiners." We believe that all the referees are not entirely destitute of modesty; but, really, this is going too far. For men who became acquainted with gas analysis but yesterday, to boast of having put "ample checks" upon such examiners as Mr. Keates and Mr. Heisch, is simple impertinence.

### THE ANGLO-MEDITERRANEAN TELEGRAPH COMPANY.

LTHOUGH the Company has been in A existence for a short time only, and commenced working their traffic in October last, after the successful submersion of their deep-sea cable, they have just declared a dividend at the rate of 10 per cent. per annum. This should give great encouragement to investors in submarine cables. The directors report that, "since the issue of the last report, the British Indian Submarine Telegraph Company has been established for the purpose of laying a cable from Suez to Bombay. A mutually advantageous arrangement for the exclusive interchange of traffic between this Company and the British Indian

returns upon their capital." In the original contract, when this Company was established, it was agreed that the Anglo-Mediterranean Company should pay to the Lords Commissioners of Her Majesty's Treasury the sum of £2,000 per annum, it being understood that the then existing Malta and Alexandria cable be abandoned from the date of the laying of the new cable.

The old Malta and Alexandria cable has seen vicissitudes. Destined originally for Rangoon and Singapore, it was unfortunate in its departure from this country. The vessel carrying a portion got ashore, and innumerable delays occurred, and, finally, its destination was changed; and, in the autumn of 1861, it was successfully submerged between Malta and Alexandria. As a rule, it may be safely taken that a cable, specially designed for one place, is not the most appropriate for another place; but there was the cable, and the result is no exception to the rule. The cable, not being intended for deep rule. The cable, not being intended for deep water, was submerged in generally very shal-low water. It was first laid from Malta to Tripoli, and from Tripoli along the coast to Alexandria, touching at Benghazi. The sections from Tripoli to Alexandria were laid pretty close to the shore, and with some difficulty, as the route had to be sounded all the way and carefully buoyed, the water being found generally to deepen suddenly. The cable, after submersion, was soon in working order, and found to answer admirably. But, in 1863, the first mishap occurred. An interruption took place; these yearly became more frequent, involving a large amount for repairs, besides causing lengthy interruptions to traffic. The result has been the successful establishment of the new line, and the agreement for the abandonment of the old line. This, we are glad to say, is not to be carried out. It would be a sorry fact to record that such a length of cable was entirely abandoned.

By mutual arrangements between the Treasury, the Anglo-Mediterranean Company, and the Telegraph Construction and Maintenance Company, it has been determined to put this cable in good working order again; and we hear that, after a careful examination of the cable, it has been determined to make it a cable, it has been determined to make it a reliable alternative line, to remove all the existing faults, and to carry into deeper water those portions now lying in rocky ground near the headlands on the African coast, where most of the faults have occurred. For this purpose, 48½ miles of new cable have been purchased. This, in addition to 33 miles in stock at Malta, and a large amount lettly interested in the selle will it is absorbed. lately inserted in the cable, will, it is believed, be sufficient to place the cable in thoroughly good and, it is to be hoped, in more permanent working order. This arrangement must be considered as most satisfactory, as a duplicate line will then be at work between Malta and Alexandria. Our traffic with the latter place is most important, and our through traffic to India considerable. This latter, on the completion of the British Indian cable, will be largely increased, and the certainty of transmission will be rendered more probable by there being an alternative route.

### IMPROVED REFINING PROCESS.

TT is rapidly being understood that in the various semi-mechanical, semi-chemical processes which are inseparably connected with many of our industrial arts, nothing should be permitted to be lost. Formerly, when deleterious gases were generated during any chemical operation, attendant upon the manufacture of any article, it was considered the height of ingenuity to devise means by which they might escape from the neighbourhood of the premises and the workmen where Company has been concluded, and the directors congratulate the shareholders upon the prospect of increased traffic and increased vert a noxious and disagreeable substance into

a valuable article of commerce—the object NOTES aimed at was to get rid of it at any price. No matter what might be the nature of its constituents, no matter what valuable ingredient might be carried along with it in its course, the object was to let it get away, and distilled gold would have been given to the winds with the same recklessness and heedlessness with which a man would blow a whiff from his pipe. Provided the ultimate result of the operation was attained, manufacturers paid little attention to the host of miscellaneous substances, solid, liquid, and gaseous, which appeared, as it were, to be insignificant contingencies upon the formation of the product desired. Since this reckless disregard for these accidental productions has given place to a careful study of their nature and properties, and the best manner of preserving and utilizing them, it has happened that in some instances the conditions have been reversed. That which was formerly thrown away as possessing no value of any kind, is now esteemed far more than the substance, for the production of which the whole process was conducted. As the alchemists of old, in their of old, in their insane search after the philosopher's stone, or the fabled transmutability of metals, discovered accidentally numerous rare and important substances, so have our own chemical operations been productive of useful and valuable results. There is scarcely a single process now, in connection with manufacturing and industrial arts, into which a most rigid and searching scrutiny has not been made, with the view of detecting the escape of any valuable and convertible ingredient, and taking measures to utilize it. It has been remarked that "nothing in nature is lost, and there is no reason why the same truth should not hold good in the numerous operations attendant upon the daily advancement of chemical and mechanical science. refining of the precious metals is a process which has existed from the earliest times, and which, with many improvements, has been handed down to the present day. Its principal feature consists in dissolving in concentrated sulphuric acid particles of silver and copper. During the operation, vapours of sulphuric and sulphurous acid are disengaged and conducted by leaden pipes into the condensers, which are filled with cold water, and subsequently into leaden chambers or receptacles, where a portion of the sulphuric acid is condensed. The sulphurous acid suffers little or no condensation, but escapes up the chimney as well as the remainder of the sulphuric acid, which has likewise not been condensed in the chambers. With a view of preventing so serious a loss of a very useful chemical reagent, M. Dubois-Caplain has recently patented an improvement upon the process, which is likely to prove of some importance.\* Instead of leading the gases and vapours simply into cold water, he introduces into the chambers appropriated to their reception and condensation, a quantity of very fine wrought-iron shavings or strips. He also brings them in contact with a jet of steam, situated in the line of draught. Under the combined action of the steam and the iron, the two acids are decomposed, and sulphate of iron is formed, which passes off in a state of solution. A double object is thus effected. Not only are the deleterious gases absorbed and rendered innoxious, but they serve to produce a substance which is both valuable in itself and is also one for which a ready sale is always to be found-a most important consideration when a bye product has to be disposed of. Whatever metal may be substituted for the iron, although the product will be different, the reaction will be the same, provided always that the metal be attackable by the acid in question, a circumstance that can be ensured a priori.

ON RECENT DISCOVERIES IN SCIENCE AND THEIR PRACTICAL AP-PLICATIONS.

BLACK LEAD AS A LUBRICATOR FOR ALL MACHINERY THE CENTRIFUGAL EXTRACTOR FOR WINE AND CIDER MAKING -A NEW SYSTEM OF KEEPING BEER ON DRAUGHT.

BLACK LEAD, which has only been used as a lubricator for wooden machinery, is now applied by M. Deloris to every kind of machine, from the heaviest vehicles to the most delicate watchwork, so dispensing with the use of oils and grease of all kinds. We are not yet informed of the manner in which the plumbago is employed, but if it can be successfully applied to railway carriages, a great saving to the companies will be effected. It is said to be used with many vehicles in Paris, and in machinery at several factories, and seems to give satisfaction.

The centrifugal machine has been applied with great success in France to the extraction of the juice of grapes and apples for wine and cider making. It is found to get out considerably more juice, and to be much more rapid in its action. It is found to get out considerably more It did with grapes, for example, in two hours more work than the press did in seventeen hours, with quality, while, with the press, it is found that it is only the first runnings which will make wine of the best quality, the long contact of the rest with the skins and stalks rendering it fit only for wines of inferior quality. In the case of cider, the use of the machines seems equally advantageous, much less juice being left in the marc, and the extraction being effected with great rapidity. The amount of force required to give a machine of the necessary size a thousand turns a minute, does not exceed that of a three-horse engine.

A very ingenious plan of keeping beer on draught completely excluded from air has been devised by Mr. Taylor. It dispenses altogether with the use of casks. A slate cistern is let into the ground, by which at once the advantage is obtained of keeping the beer at a nearly uniform temperature at all seasons of the year. But, as we have said, the all seasons of the year. But, as we have said, the chieffeature is the complete exclusion of air. This is effected by the use of a floating lid, which, of course, descends as the beer is drawn out. manner in which the lid is made to fit accurately to the walls of the cistern, and still is free to descend, could only be made clear by a drawing. But we may say that a wooden lid is made to fit very nearly to the sides. The sides of the wood are bevelled, so that only a narrow edge is presented to the walls of the cistern. Along this edge a band of canvas or india-rubber is fixed, which gives, with the bevel on the upper surface, which gives, with the bevel on the upper surface, a V-shaped space, and by packing this space with wet sand, or some soft material, the canvas or india-rubber is kept in close contact with the walls of the tank. Thus, the liquid within is completely sealed from all access of air. In corder to draw out the hear the centre of the lid is order to draw out the beer, the centre of the lid is bored, and provided with a stuffing box arrangement. To tap it, a perforated pipe is thrust through the stuffing box, and the connections to the beer engine are made in the usual way. This pipe deserves some notice. It is closed at the bottom and for an inch or so up, so that, when the lid descends to the bottom, any sediment in the tank is avoided. In this way, the beer is always drawn bright and clear. The advantages of totally excluding air from beer are very great, both to brewer and publican, whose greatest loss is made by beer turning sour, which will be en-tirely prevented by the use of this apparatus. There will be an enormous incidental saving in the cost of casks. Besides that, all the dangers of foul casks are avoided. For publicans who brew their own beer, the plan offers peculiar advantages, for the tanks will serve as fermenting vats, and besides that, they need not have a cask in their establishment.

# PARLIAMENTARY NOTES.

VESTERDAY week, Lord G. Hamilton asked the Chief Commissioner of Works whether any arrangement could be made at the Royal Botanical Gardens, Kew, whereby the public could be admitted at an earlier hour than at pre-

Mr. Layard observed that these gardens were Shortly afterwards, Sir J. Elphinstone asked the maintained for scientific purposes as well as for First Lord of the Admiralty if he would state the

pleasure, and it was in consequence of work that had to be done in the hothouses and elsewhere that it was thought necessary to keep the gardens closed until one o'clock. He trusted, however, that he might be able to make some arrangement to admit the public earlier than was the case at present

At the same sitting, Lord Garlies called attention to the armament of the sea and land defences constructed and in process of construction at Portsmouth, Plymouth, &c., and asked the Secretary for War the amount provided in this year's Estimates for such armament, independent of any saving which might be effected by the probable adoption of the Monerieff system. He said that up to June last no less than £5,118,000, or twothirds of the whole calculated sum, had been expended upon the fortifications. This being so, it became important that they should know what preparations had been made for supplying the armament of these forts.

Mr. Cardwell said that as to our land defences. there were in store now more guns than would supply the defences. As to the sea defences, there were not guns enough yet made, but there were more than could at the present moment be mounted, and the supply was gradually and steadily increasing. In reference to the amount proposed in this year's estimate for armaments, 99 10-ton guns were provided last year, and a similar number would be provided this year. This statement was not literally an answer to the noble lord, but it really gave the information he

On the motion for going into supply, Mr. M. Chambers called attention to the anomalous posi-tion of the clerks of the works and clerks of the Royal Engineer Department, and the denial pensions to their widows, and moved, "That in the opinion of this House they are entitled to, or should be granted, the same rights and privileges, according to their relative rank, as are extended to other non-combatants in the military service." Mr. Chambers argued from the terms of the Royal warrant that the widows of these clerks were en-titled to pensions the same as widows of military officers, and he added that the dangers of war, to which, as well as to the dangers arising from climate, they were often exposed, furnished an additional ground for giving pensions. It might be said that the clerks might insure their lives, but they could not do this without forfeiting their insurance when they went on foreign service, or without paying such an amount of premium as could not be spared

out of their salaries. Captain Vivian said that those clerks were to have "relative rank" with military officers of a certain grade; and the question was whether that provision entitled their widows to pensions. were really not exposed to the dangers of war, and that was shown by the fact that only two of them were employed during the Crimean campaign, and they were at Scutari. The warrant under which pensions were now asked for had nothing to do with pensions, but only with pay and allowances. He did not think that those clerks had any reason to complain. As far as their duties were concerned, they had no title to any pension allowance, or extra pension. Their case had on three or four occasions been carefully investigated, and had been decided against them, and he hoped, therefore, that the hon member would not press his motion to a division.

Mr. Maguire supported the motion, and contended that where an officer sacrificed his life in the public service his widow was entitled to a pension. He did not think the answer of the Government satisfactory.

After a few remarks from Mr. Cardwell, who observed that they were all economists in the abstract, yet when particular cases like the present arose, the Government were pressed to yield, and that it would be impossible to enforce economy if motions like the present were agreed to, the motion was withdrawn.

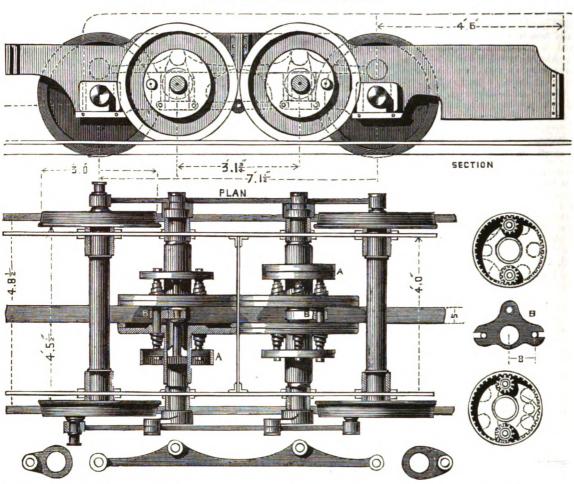
On Monday evening, Sir S. Northcote asked the Under Secretary of State for India whether the Government were taking any steps for the preservation of the fisheries in those rivers in India and Burmah where irrigation works had been constructed or were in contemplation.

Mr. G. Duff said Dr. Day, the author of the "Fisheries of Malabar," had been appointed to examine into the whole of that important subject. The Secretary of State had just sent out a dispatch to the Governor-General to give every encouragement to those officers who showed an intelligent interest in the fisheries.

<sup>\*</sup> We extract the description of this recent patent from our excellent cotemporary, "Le Genie Industriel."

#### MOUNTAIN LOCOMOTIVE. DESIGN FOR

BY MR. A. ALEXANDER, C.E.



reasons which induced the present Board of Admiralty to reverse the decision of their predecessors, and permit the extension of Ryde Pier to the westward; and whether the proposed extension was not the subject of inquiry by the late Board of Admiralty, and refused by them on the ground that it would interfere with the navigation of that part of the Solent.

Mr. Childers said there were two piers at Ryde belonging to joint stock companies. An application was made by the companies to the late Board of Admiralty to allow of an extension of the western pier to enable a ladies' bathing place to be erected there. It was strongly supported by the local authorities of Ryde, but objected to by the owners of lighters and coasting vessels, on the ground that it would diminish the access to the small landing place between the two piers, and the late Board disallowed the application. The application was renewed to the present Board, and, a recent occasion, he had made a personal inspection of the locality, as he found that the officers who refused the application were divided in opinion upon the matter. In that personal inquiry he had the assistance of two distinguished officers—Sir Sydney Dacres and Admiral Simonds, who were of opinion that, with a modification of the plan, no interference with the navigation would take

#### THE FRENCH ATLANTIC CABLE.

THE following telegram has been received from Captain Donaldson, of the steamer William Cory":

"ST. PIERRE, NEWFOUNDLAND,

June 23.

"Arrived here to-day; all well. Will leave this evening to proceed with the work of laying the St. Pierre shore end."

Sir Daniel Gooch, Chairman of the Telegraph Construction and Maintenance Company, telegraphs as follows:-

"Great Eastern," June 23.
"Distance run from Brest, 294 knots. Cable paid out, 310 knots. Electric condition perfect."

#### DESIGN FOR A MOUNTAIN LOCOMOTIVE.

N our notice of the conversazione at the Institution of Civil Engineers, we referred to a model of a mountain locomotive, by Mr. A. Alexander, C.E., the designer of the Mont Cenis locomotives. We now illustrate Mr. Alexander's present proposition for working the mid-rail system. At each side of the mid-rail are mounted a couple of disc wheels, a portion of the faces of which, near the periphery, rest against the mid-rail. This last may consist of a bar not more than three-quarters may consist of a bar not more than three-quarters of an inch deep, gripped between the opposing whoels on horizontal axles. The wheels are forced against the rails by volute springs in the following way:—The mid-rail wheels are driven by crank pins passing through the arm B, which is solid with the shaft. A transverse brake shaft is carried between the two mid-rail axles which works friebetween the two mid-rail axles, which works friction straps upon the drums A A, the effect of which is to tighten up the screws, and through the medium of the six or four volute springs behind each pressure plate, to force forward the mid-rail each pressure plate, to force forward the mid-rail wheel to the amount required. This scheme appears to be the best solution yet offered of the mid-rail difficulty. We get rid at one sweep of an immense mass of complicated machinery; two outside cylinders—not shown—working in the ordinary way, with outside valve gear, supply the power required. The ordinary features of the locomotive are all retained, and the weight and cost of the machine are enormously reduced. No difficulty motive are all retained, and the weight and cost of the machine are enormously reduced. No difficulty will be encountered in keeping oil off the mid-rail— a very great difficulty with the present Mont Cenis engines; and, all the bearings being horizontal, the oil will not tend to run down the shafts and

tice Bovill undertook himself to settle the terms of the rules for constituting the proposed court. The matter was heard by his lordship in chambers on the 8th inst., was then fully argued by counsel, and the rule has been since finally settled. following are the matters referred to the arbitra-ment and determination of the court:—1. The reduced to the 12s. 10d. question, the cost of the parchments and engrossments, to be considered on legal and moral grounds. 2. The claims of Mr. Edmunds against the Crown, as appearing on the accounts and proceedings in Chancery, also to be considered on legal and moral grounds. 3. The claims of Mr. Edmunds against the Crown, for damages and compensation, in consequence of the alleged libellous and defamatory reports of Messrs. Greenwood and Hindmarch, and the subsequent proceedings of the Government thereon in Parliament, in the courts of law and elsewhere. The court to sit in public. The action for libel ("Edmunds v. Greenwood") thus referred, is, in fact, a proceeding against the Crown; it has been so dealt with throughout by the Crown officers; and Mr. Greenwood, the nominal defendant, servant of the Treasury, and author and publisher of the reports in question, is indemnified by the Treasury against damages and costs.

VISIT OF WORKING MEN'S CLUBS TO THE NEW BUILDING OF THE UNIVERSITY OF LONDON.

the machine are enormously reduced. No difficulty will be encountered in keeping oil off the mid-rail—a very great difficulty with the present Mont Cenis engines; and, all the bearings being horizontal, the oil will not tend to run down the shafts and away from the rubbing surfaces.

THE EDMUNDS CASE.

THE questions as to the terms of reference to an open court of arbitration of all matters in dispute between Mr. Leonard Edmunds and the Crown (proposed by the Crown officers for the third time in January last, and which have been in one form or other in dispute for two years and a-half), have at last been settled, and the court of arbitration constituted. It will be recollected that, at the last hearing in open court, the Lord Chief Jus-

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THE IRON AND STEEL INSTITUTE.

N Wednesday evening last, the members of the Iron and Steel Institute held their first meeting in the rooms of the Society of Arts. The objects of the Institute are to afford a means of communication between members of the iron and steel trades upon matters bearing upon the respective manufactures, excluding all questions connected with wages and trade regulations, and to arrange periodical meetings for the purpose of discussing practical and scientific subjects bearing upon the manufacture and working of iron and steel. The meeting was fully attended, and was presided over by the Duke of Devonshire, who delivered an inaugural address of considerable length, and greatly to the point. The president reviewed the success which had attended the formation of scientific and agricultural societies, and saw no reason why equal advantages should not accrue to the iron trade by association. Then his Grace passed on to review the early history of iron, the manufacture of which was mentioned by Homer and Hesiod, and had been asserted by Mr. Layard to have been known in Assyria in 900 B.C. He then noticed the early methods of manufacture down to the period of the use of coal, which gave such a vast impetus to the manufacture of iron in this country. He often work a proposed to the invention country. He afterwards referred to the invention of the "hot blast," the increased supplies of ore, and other causes which had contributed to the present importance of the iron manufacture. The processes by which pig iron, malleable iron, and steel are manufactured having been alluded to, the president referred to the utilization of the waste of gases from the blast furnaces; and went on then to show how the raw material and manufacture were distributed over the world. His Grace observed that the problems to be solved now which were of the most importance were, economy in the consumption of fuel, and a greater utilization of the waste gases. Mineral oil had been used in the dockyards in place of coal. It was also highly important to obtain the metal as pure as possible, and though chemistry had been brought to the aid of the manufacture, yet the chemistry of iron and steel was still, in many respects, obscure and uncertain. We hope shortly to print this interesting address

#### ON THE CAUSE OF A PINK COLOUR IN WHITE LEAD CORROSIONS.\*

BY MR. WILLIAM BAKER, F.C.S.

TN some contributions to the metallurgy of lead published in the "Philosophical Magazine 1862, I attributed a contain min." , I attributed a certain pink tint, occasionally seen in white lead corrosions, to the presence of small quantities of copper. As the results of any experiments upon the corrosion of lead by the combined action of fermenting bark, acotic soid vapour, and atmospheric oxygen can only be arrived at after the expiration of ten weeks or three months, the progress of further investigation in this matter has been necessarily slow. I have been unable to isolate the colouring matter; but I wish to correct the statement that the pink colour is due to copper, and to detail some conclusive proofs that it is caused by finely-divided silver.

roofs that it is caused by finely-divided silver.

Having obtained many tons of lead which contained only traces of copper, I found in several instances the pink colour still quite evident in the corrosions. By the method which had been employed for refining the metal, there could be only silver left as an impurity in any perceptible amount. I therefore sought for evidence that this substance could produce such a result. Upon analyzing 5,000 grains of a perfectly white corrosion, and one which was distinctly and uniformly pink, the which was distinctly and uniformly pink, the result showed that the composition of the two samples differed mainly in the amount of silver:—

CuO. FeO. NiO. Ag. -0050 -0022 trace -0005 per cent. -0060 -0022 -0013 -0058 ,, White corrosion Pink corrosion

A small quantity of silver was then added to a portion of the lead which had produced the white corrosions, and this was again submitted to the corroding action. The result was a decided pink carbonate. This synthetical experiment was repeated many times with a like result upon various samples of lead which had before produced a white carbonate; and I find that the pink colour begins to show at the edge of the metallic portion left uncorroded when the silver amounts to more than loz. per ton of lead. A decided colour, which is uniform throughout the mass of the corrosion

is obtained when the silver amounts to about 11oz. per ton. A fracture of a dense corrosion often shows the crystalline character of the metallic lead, which is defined to some extent by the pink load, which is defined to some extent by the pink colour—as if the silver had segregated out at certain faces of the lead crystals. By the addition of a small quantity of arsenie or antimony, the pink colour was replaced by a dull purple; and a clear pink tint was only obtained when all the oxidizable metals had been removed.

I come now to the discussion of the state which the silver exists to cause a pink or reddish reflection of light. Silver does not oxidize under the conditions of exposure to acetic acid vapour and oxygen of the air. Moreover, oxide of silver and silver carbonate are themselves decomposed and reduced to a metallic state by a heat below that attained in the stacks of fermenting tan. The silver must consequently be in the metallic state. As confirming this statement, I made the following experiments:—Silver carbonate was triturated with white lead and water, and then dried. Upon increasing the temperature, a delicate pink tint became visible upon the reduction of the oxide of silver. If a small quantity of silver carbonate be precipitated along with lead carbonate, the colour, upon drying and heating, is more uniform, and it may be obtained exactly resembling the tint seen on white lead corrosions.

The colour of the photographs obtained by means of silver salts is also evidence in favour of means of silver saits is also evidence in ravour of the metallic state of the silver; and I may also adduce the fact that a ray of light, when reflected ten times from a polished silver surface, is dis-tinctly of a reddish colour.

#### CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

THE annual general meeting of this Society was held on Wednesday, the 23rd inst., at the Whittington Club, when the report of the council and financial statement was submitted and approved. On the retirement of the president and council from office, the members expressed themselves greatly indebted to the president for his services; also to the members of council. The following gentlemen were elected to fill the various following gentlemen were elected to fill the various offices for the ensuing session—1869-70:—As president, W. Forsyth Black; G. J. Crosbie Dawson and James B. Walton as vice-presidents; members of council, R. M. Bameroft, G. R. Godson, Frederick A. Klein, William Meaking, and Frederick H. Roberts; honorary secretary, G. W. Usill; and Arthur F. Pain as honorary treasurer.

Messrs, Roberts and Dawson having resigned their respective posts of honorary secretary and

their respective posts of honorary secretary and treasurer, which they have so successfully held for a period of nine years, and to whose efforts the members are greatly indebted, it was proposed and carried by acclamation, that the special thanks of the Society be presented them, suitably engaged and illuminated many reliable expressions. grossed and illuminated upon vollum, expressing the warm appreciation their services have given. Mr. G. W. Usill, late member of council, has agreed to act in place of Mr. Roberts, and from his previous exertions it is anticipated that he will prove a valuable officer; likewise Mr. Arthur F. Pain, who has consented to act as honorary treasurer.

It was resolved that the Society, for the future, should work under the Scientific Institution Act of 1864, and it was determined to hold during the recess the second annual dinner; likewise a conversazione. Numerous other considerations were versazione. Numerous other considerations were taken into account, but it should be mentioned that the society is in a very flourishing condition. Its objects are to avoid any attempt to compete with the older institutions, but to offer special facilities for the younger branches of the profession for reading and discussing papers, visiting works of importance Acc of importance, &c.

### SOCKET JOINTS FOR IRON PILES.

N constructing iron screw piles and columns, such as are employed in the erection of bridges, piers, &c., it has hitherto been customary to forge on one end of each length an enlarged portion, which is bored out to form a socket to receive the end of the next length. This method of construction is very costly, and also very imperfect, as the necessity of welding on the socket freed, quently leaves a portion of the pile unsound immediately above the socket. Another method ane objectionable on account of the liability of cast iron to sudden fracture. These couplings being necessarily made much larger in diameter than

THE number of visitors to the Patent Office Museum, South Kensington, for the week ending June 19, was 3,395. Total number since the pening of the Museum, free daily (May 12, 1858), 1,589,261.

the pile or column, give it an unsightly and clumsy appearance. We are, therefore, glad to bring before our readers a method of coupling lately patented by Mr. Joseph Westwood, jun., of Tredegar House, Bow-road.

In constructing this improved socket joint, Mr. Westwood forms a tube of wrought iron or steel either by bending a plate of metal and welding its edges together, or by coiling a bar upon a mandril and then welding it, or by welding together a series of rings or hoops of the required diameter. The interior of the socket or tube is bored to fit the ends of the sections of the pile or column to be united. The exterior of the socket is then turned to give a neat and finished appearance to the work, or the exterior of the socket may be made hexagonal or of any other shape. The socket is then heated and tightly shrunk upon one of the sections The end of the section to be united or coupled to this section is then inserted into the socket, the two ends being made to butt together. Holes are then drilled through both the socket and the pile, into which holes keys are inserted and secured

#### THE CRYSTAL PALACE.

THE CRYSTAL PALACE.

The directors of the Crystal Palace Company have issued their report, which is very satisfactory, as showing that the arrangements for providing attractive entertainments for the public are proving successful, and that the financial position of the undertaking is becoming more encouraging. The station of the Metropolitan Fire Brigade on the roadfront of the Palace has been for some weeks occupied by the men and engines of the Brigade, so that the proprietors have now an additional permanent force in full efficiency, without any charge to the company for the increased security. The amount of insurance on the buildings and its contents is nearly £112,000. The Act of Parliament enabling the company to lease a portion of its surplus lands, the company to lease a portion of its surplus lands, which was authorized by the proprietors at the meetings of June and December last, has since received the Royal assent, and the directors are about to ask authority to exercise the powers obtained to grant building lease

Last Saturday, the rose show was held at the Palace, and proved one of the greatest successes of the season. Stands were erected along the centre of the naves, under an awning that extended the whole distance from the centre transept to the Tropical Department. On these stages, the roses, embracing overy hue from white to black, were fixed in vases, backed up by mossy banks, and so divided into sections that enabled the visitors to inspect them without the slightest crowding or inconvenience. Mr. C. Turner, of Slough; Messrs. Paul and Son, Cheshunt; Mr. B. R. Cant, Colchester; Mr. A. Moffatt, gardener to Earl Rosslyn, Essex; Mr. P. Stoddart, Colchester; Mr. W. Soder, Brentford; and Mr. H. Exell, Maidstone, were successful in gaining the first prizes for different varieties of roses. A grand musical festival, under the direction of the Sacred Harmonic Society, and conducted by Sir Michael Costa, is an val, under the direction of the Sacred Harmonic So-ciety, and conducted by Sir Michael Costa, is an-nounced for Tuesday, the 29th inst., in honour of his Highness the Viceroy of Egypt, upon which occasion he will be present. The orchestra will comprise be-tween 3,000 and 4,000 performers, and will bearranged as on the occasion of the Handel Festivals. There will be a display of the fountains in the afternoon, and another in the evening, at the time of the pyro-technic display. technic display.

### EMIGRATION TO THE RIVER PLATE.

EMIGRATION TO THE RIVER PLATE.

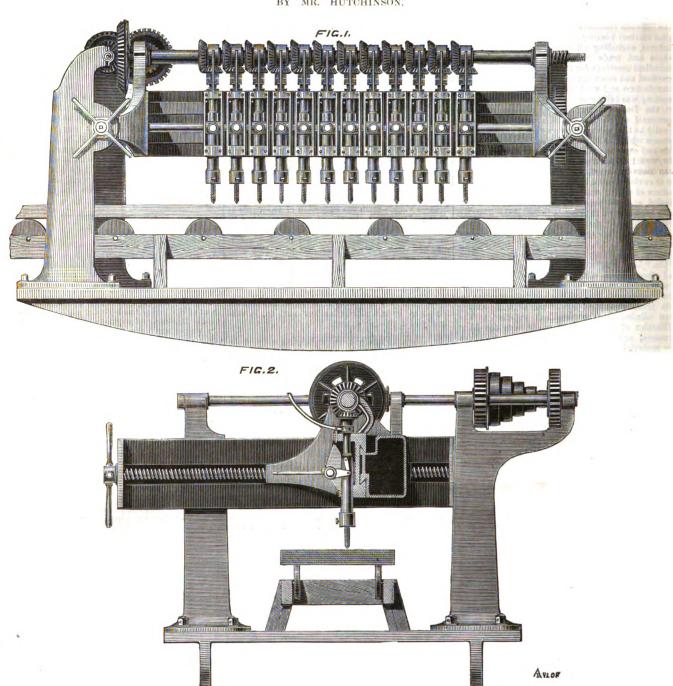
TOR some time past a series of most interesting letters have appeared in the "Field" newspaper, concerning the River Plate as a field for emigration, and having special reference to the domains of the Argentine Republic, and the inducements put forth by the rulers of that republic to intending emigrants. The letters are well worth perusal, and being written chiefly by persons who have themselves emigrated, have quite a practical value and importance. They have been collected into a pamphlet, which can be consulted with profit by any person interested in emigration schemes. They contain explanations of the most profitable systems of farming, and set forth clearly the various advantages which are held forth to emigrants. The Secretary of the Central Argentine Railway Company intimates that he will be happy to forward copies of the pamphlet on application, or to send them to any address furnished to him, and to give every information in his power respecting the lands for settlement ceded to the company on each side of the railway in the provinces of Santa Fe and Cordova. The company's office is 60, Gracechurchstreet, London, E.C.



Communicated by the Author to the "Philosophical

#### MULTIPLE DRILLING MACHINE.

BY MR. HUTCHINSON.



### MULTIPLE DRILLING MACHINE.

MACHINE which will be found extremely A useful to engineers, bridge and girder makers, shipbuilders, &c., is the multiple drill illustrated in the accompanying engraving. It is makers, shippunders, &c., is the mutiple drill illustrated in the accompanying engraving. It is the invention of Mr. Hutchinson, of the firm of Messrs. Pease, Hutchinson and Co., of the Skerne Iron Works, Darlington, who have several of them in use at their works with great advantage. These machines are made either stationary or portable; that illustrated by an absorpt to the forecast electric days are the stationary or portable. that illustrated by us belongs to the former class. They carry their own engine when required, and possess several important advantages; each drill is self acting separately, and adjustable in pitch separately, possessing more ready means of adjusting the pitch than has ever before being applied to multiple drills. Each drill has an independent frame and they can thus he readily set to any frame, and they can thus be readily set to any regular or irregular pitch. From our engraving, fig. 1 of which shows a front elevation and fig. 2 an end view of the machine, it will be seen that the whole drill-frame has a lateral motion, by means of which each row of rivet holes can be formed in succession. Each drill is also furnished with a small clutch and handle, and can be engaged or disengaged independently, this arrangement enabling a broken or blunt drill to be replaced without stopping the remainder. The feed is obtained by a double worm motion at one end of the framing

moving a shaft passing across the drill frame immediately in front of the drills; on this are double levers attached to links connected with the drill spindles, as shown in the engraving. Through the boss of each lever passes a large setpin, which at once serves to connect the self-acting feed and as a lever handle for withdrawing the feed and as a lever handle for withdrawing the drill. The driving shaft passes over the centre of the drills, driving each by means of a pair of bevel wheels. Where the girder or other work is composed of a number of plates, these machines, in combination with Mr. Hutchinson's continuous planing machine, are of special advantage. The plates and angle irons are drilled and planed in the position they will occupy in the finished work, and each row of rivet holes is made through the entire thickness at one operation. By this means. entire thickness at one operation. By this means, no drifting is afterwards required. As an instance of what these machines will do, we may mention that a 12-spindle drilling machine easily drills 2,000 holes per day ‡in. diameter through 9-16in. plates, and this with frequent variations of pitch. A planing machine with frequent stoppers for supplements. planing machine, with frequent stoppages for sup-plying fresh plates, &c., will plane forty super-ficial feet per day.

PHARMACEUTICAL CONGRESS, to which all civilized nations are invited to send representatives, is to take place at Vienna in September.

### NEW TYPE COMPOSING MACHINE.

NEW TYPE COMPOSING MACHINE.

P. R. C. E. REEVES, of 119, Collins-street East, study of mechanical type setting, and has at length designed a machine of which he sends us the following particulars. The composer's case, like the one at present in use, consists of shallow have and may year from 21st to 2st in length. like the one at present in use, consists of shallow box, and may vary from 2\frac{1}{2}ft. to 3ft. in length, and the same in breadth. Around the box, cells are placed to contain type not constantly required. The rest of the box is divided into two parts. These divisions are again divided by three plates, which are fixed in the sides of the centre piece of wood and the cells. Each of these plates has twenty-six grooves or notches, which vary in depth from an eight to a fourth of an inch. The grooves in the upper plate are different to those in the lower plates. They are notched to prevent the rod, which is run through perforated type, from tilting up when the lower extremity becomes beavier than the upper. A simpler plan than this tilting up when the lower extremity becomes heavier than the upper. A simpler plan than this has lately been used. It consists of a thin rod with notches to correspond, with the grooves in the lower plates, the heads of the rods being slipped under, and will be found to fix them much better. The type is perforated just above the centre. They are placed on the metal rod already mentioned, which is placed in the grooves. The type used has been perforated by hand. It is rather too

long, and cannot be used with the same facility as a shorter and more beadlike type, cast for the purpose. It is scarcely necessary to observe that small type will not admit of being perforated in the same direction as the large, but Dr. Reeves observes that they are easily turned when they descend into the composing stick. The composing stick works on rollers to enable the composer to move it freely with one hand, while, with the fingers of the other, he brings the type down. The proposed arrangement does not strike us as being at all calculated to facilitate the process of type setting, but rather to retard it; inasmuch as, after distribution, the types have all to be skewered on to the metal rods. In effect, this method would impose upon the compositor extra manipulation for every type, which, multiplied by 10,000—a day's work—would seriously affect his earnings and the work produced at the end of a week. We think Dr. Reeves had better try again.

#### BENTLEY'S SYSTEM OF WELL SINKING.

THERE are certain kinds of water-bearing strata, such as silt, quicksand, &c., from which it is difficult and even impossible, with ordinary appliances, to obtain a supply of pure water, although it may be present in abundance. With a view of overcoming this difficulty, Mr. J. F. Bentley, of Peterborough, has just patented the improved method of sinking wells illustrated in the accompanying engraving. The apparatus, as shown in fig. 1, consists of an iron cylinder α, the bottom of which is fitted with a cone b, or is provided with a conical end to which a socket c is attached. The socket is screw-threaded or chased so as to admit of the passage of the threaded end of the tube d. There are also a series of perforations in the threaded portion through which the water is admitted. The tube d is capable of being raised or lowered by being turned round in the usual way by hand or other power.

or lowered by being turned round in the usual way by hand or other power.

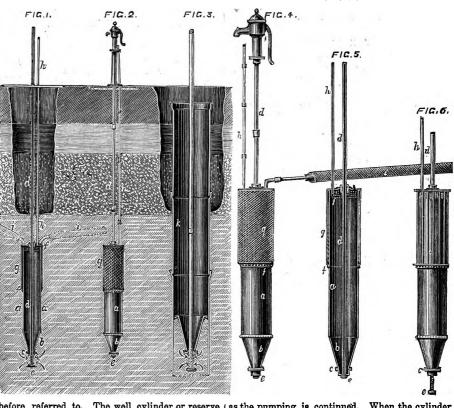
The use of the tube is first to draw up the silt or sand by means of pumping. For this purpose, the tube is screwed down until the lower perforations are below the conical end of the cylinder. A free passage for the silt or sand, mixed with water, into the tube is by this means provided, and, when a pump which is fixed on the top of the tube, as represented in fig. 2, is set in motion, the silt or sand and water are raised to the surface. Secondly, the tube, which is perforated at the bottom, serves to convey the water from within the cylinder to the pump. To effect this, the tube is screwed back or raised up so that a collar or plug e is brought in contact with the conical end of the cylinder, whereby a watertight joint is formed. This is done after sufficient silt or sand has been pumped up to allow the well cylinder to sink to the required depth. All the perforations are thereby brought up and raised within the inside of the conical end of the cylinder, thereby cutting off the connection between the bottom of the cylinder and the silt or sand and water outside. The tube d passes up the centre of the cylinder a, and through an opening provided in the top or cover. This opening is packed round the outside of the tube to stop the entrance of the silt or sand into the cylinder. The tube is continued upwards to the surface of the ground, and a common suction pump is attached to it. The detail arrangements are clearly seen in figs. 4 and 5, which are enlarged views of figs. 2 and 1 respectively.

entrance of the silt or sand into the cylinder. The tube is continued upwards to the surface of the ground, and a common suction pump is attached to it. The detail arrangements are clearly seen in figs. 4 and 5, which are enlarged views of figs. 2 and 1 respectively.

Immediately below the top or crown of the cylinder, and extending downwards a few inches, are a series of perforations, through which the water flows into the interior of the cylinder or reserve chamber. The top and bottom of the cylinder is provided with flanges ff, and the same provision is made about half way down the cylinder. The flanges sorve to support and secure the filtering medium, which consists of a sheet g of perforated metal, or gauze, which is wound round the cylinder, covering the space between the flanges. Between the perforated plates, a layer or layers of suitable material is interposed to prevent the flow or passage of the silt or sand into the cylinder, so reserve chamber, as shown in fig. 6, which are secured to the inner surface or to the outer surface of the cylinder, so as to form a space and to prevent its coming into contact with the well cylinder or reserve chamber, or the space may be wholly or partially filled with charcoal, coke, coarse gravel, or other material. The space thus formed between the two surfaces, e., the reserve cylinder and the filtering medium, allows the passage of the water upwards till it

# IMPROVED SYSTEM OF WELL-SINKING.

BY MR. J. F. BENTLEY,



before referred to. The well cylinder or reserve chamber is also provided with a tube or pipe h connected to the top, and communicating with the inside, and carried upwards to the surface of the ground and provided with a self-acting air valve. The object of this tube is to allow the air to escape out of the well cylinder when it is filling with water, and also to serve as a channel to convey water into the cylinder to act as a weight in order to facilitate the sinking.

In some cases, Mr. Bentley fits radiating or lateral tubes i i to the upper part of the cylinder, which are used as feeders to the main cylinders. These tubes are perforated and provided with an external filter medium similar to that used in the well cylinder. They are arranged in trenches dug to receive them; and may be held in position by being suspended to a cross bar of wood or iron inserted into the ground above. The tubes, when laid at a small incline towards the well, allow the water collected by them to flow into the well through openings in the top or crown, where the end of the tube is secured.

Mr. Bentley's mode of sinking cylinders or

Mr. Bentley's mode of sinking cylinders or caissons in forming foundations, piers, &c., in silt, quicksand, or similar strata, by the employment of the cone v and central tube d, is represented in fig. 3. The lower length of the cylinder or caisson k is provided with an internal flange upon which the cone is fitted, and by which it is supported. The cylinder or caisson is filled with water to weight it in order that it shall sink to the required depth in the silt. At the same time, the silt or sand is pumped up from below the conical end, and, when a sufficient depth is attained, or a firm stratum is reached, the tube is turned so as to bring its perforations within the cylinder; the water is then pumped out of the cylinder. The conical bottom can be removed, and the caisson then used for the purpose for which it has been sunk.

or passage of the silt or sand into the cylinder. The external material, which acts as a filter, is provided with a series of vertical rods or tubes, as shown in fig. 6, which are secured to the inner surface or to the outer surface of the cylinder, so as to form a space and to prevent its coming into contact with the well cylinder or reserve chamber, or the space may be wholly or partially filled with charcoal, coke, coarse gravel, or other material. The space thus formed between the two surfaces, i.e., the reserve cylinder and the filtering medium, i.e., the reserve cylinder and the filtering medium, allows the passage of the water upwards till it reaches the perforations in the top of the cylinder or caisson supon this system, the surface of the soil is dug out until a sufficiently large opening is made, as shown in the engraving, and the natural water level is reached, when the conical ond of the well cylinder or caisson is lowered down to the silt or sand, and water is each of the cylinder, and the pump set in action. The silt or sand mixed with water is pumped up to the surface of the soil is dug out until a sufficiently the surface of the soil is dug out until a sufficiently and the natural water level is reached, when the conical ond of the well cylinder or caissons upon this system, the surface of the soil is dug out until a sufficiently and the natural water level is reached, when the conical ond of the well cylinder or caisson is lowered down to the silt or sand, and water is admitted, as we have already explained. The pump tube is then screwed down below the conical ond of the well cylinder or caissons upon this system, the surface of the soil is dug out until a sufficiently and the natural water level is reached, when the conical ond of the well cylinder or caisson is lowered down to the silt or sand water is element of the soil to sand water is admitted, as we have already explained. The pump tube is then screwed down below the conical ond of the well cylinder or caissons upon this the sufface of

as the pumping is continued. When the cylinder has reached the desired depth, the pumping is discontinued. In the case of a well, the cylinder is staved or fixed in its place and is ready for use. We understand that one of these wells has been at work for the last six months at Spalding, in Lincolnshire, with great success. Mr. Samuel E. K. Capps, of 17, Westgate, Peterborough, is the sole licensee and manufacturer.

# SMELTING, CARBURIZING, AND PURIFYING IRON.

MR. ISHAM BAGGS, of High Holborn, has patented some processes by means of which the smelting, carburization, and purification of iron are greatly facilitated. In charging the furnace, the coal or coke usually thought necessary for smelting is in a great measured dispensed with, and in its place Mr. Baggs burns in the smelting furnace coal gas, hydrogen, carbonic oxide, or other combustible gas or gases, and also the vapour of petroleum, naphtha, and other hydrocarbons under pressure and in combination with a blast of hot or cold air. In the case of the inflammable hydrocarbon vapours, the same may be forced into the furnace under the pressure of their own atmospheres, or by means of mechanical appliances. The gases and vapours which are employed for the purposes of this invention may be previously mixed with the air furnished by the blast, or may be caused to meet the air in the furnace or at the tuyeres. The proportions of the mixture when a combination of gas or vapour and air is employed are subject to constant regulation by valves. One very convenient mode of obtaining combustible gases for the purposes of this invention is to generate coal gas in the usual way, and then carbonic oxide, and to blow air or carbonic oxide gas under pressure through the retort containing the iron, whether in or out of the furnace, as may be desirable, coal gas or other carbides or other materials containing carbon are blown through the furnace or brought into contact with the molten metal by blowing

For the purpose of carburizing the iron, whether in or out of the furnace, as may be desirable, coal gas or other carbides or other materials containing carbon are blown through the furnace or brought into contact with the molten metal by blowing them through it. Carbon in any suitable form or combination may also be directly introduced into the furnace for the purpose of carburization, and although generally for smelting purposes it is desirable to exclude all solid mineral fuel from the furnace as part of the charge, yet where a suspension of operations is necessary, such a charge of coal, coke, or other fuel may be introduced into the

furnace as will prevent the materials on renewal of work from falling through the crucible or any iron remaining therein or below it from being permanently solidified. When purification is required, hydrofluoric acid is blown through the molten metal on its way from the furnaces, the gases being mixed with common air or with some gaseous dilnent.

#### THE NEW ZIRCONIA LIGHT.

THREE or four months ago, the news spread in England, through the medium of the scientific newspapers, that a discovery had been made in France, which would have the effect of abolishing the limelight by substituting zirconia for the lime cylinder. The advantages were stated to be that zirconia is not eaten away by the oxyhydrogen flame, and that when not in west in the state of the property in the state of the and that when not in use, it does not absorb moisture and crumble to pieces like lime; also, that in consequence of this stability, the ordinary clockwork of oxyhydrogen lamps to turn the lime cylinder would be unnecessary with zirconia. It was further said, that the zirconia gave more light than lime under the same oxyhydrogen flame. Considerable interest in the convergence of the considerable interest. be unnecessary with zirconia. It was further said, that the zirconia gave more light than lime under the same oxylydrogen flame. Considerable interest in the new invention was, consequently, raised in this country, among the many who use the limelight, but weeks passed away without anybody being able to procure the zirconia cylinders in London. One night, however, at a soirce at King's College, the zirconia light was oxhibited burning with great steadiness and brilliancy, in the presence of Professor W. Allen Miller, F.R.S., and many others, but no accurate tests were made, and both then and afterwards, the zirconia cylinders were as unprocurable in London as ever. Three weeks since, however, one of the first zirconia lamps procurable for examination in this country reached London, and was sent by Mr. R. J. Fowler, the Parisian correspondent of the "British Journal of Photography," to Mr. John Traill Taylor, the editor of that journal, with the request that he and Mr. W. H. Harrison would test its working qualities. The lamp was the property of Messrs. Harvey, Reynolds, and Co., Leeds. Accordingly, some experiments with the lamp were tried at the workshops of Messrs. Darker Brothers, philosophical instrument manufacturers, at Lambeth.

philosophical instrument manufacturers, at Lambeth.

At present, the French company refuses to sell the zirconia cylinders without their lamp be also purchased. According to the "Engineer," this lamp made for special use with the zirconia, gives a vertimade for special use with the zirconia, gives a vertical flame, and the piece of zirconia is held in it by a little brass support. The piece of zirconia was excessively small—about as big as a pea—and here at once was a source of great loss of light, because the flame was competent to raise to whiteness several times the area presented to its action. On this account alone, the total amount of light was very much less than the same flame of are writhe lines. much less than the same flame gave with a lime cylinder, so as to put competition between the two out of the question, unless the zirconia surface be very greatly increased in size. The experimentalists then cut down a piece of lime till it equalled the zirconia in size, and the lime and zirconia were exposed in turn to the fame, the result being that the zirconia was found to emit a less white and brilliant light than the lime under the same conditions, nor did variations in distance from the nozzle of the jet alter variations in distance from the nozzle of the jet alter this result. Next, many variations in the pressure of the gases were tried, but the result was not altered. Then, substituting an English "blow-through" jet for the blow-pipe sold by the French company, the same inferiority of the light from the currents was perceptible, nor did variations of pressure affect the result. Lastly, a good orthodox oxy-hyrogen blow-pipe was tried, wherein the two gases mix thoroughly some little distance behind the nozzle, and again the results were the same. These conand again the results were the same. These con-clusions do not in any way affect the question of the permanency of zirconia under the fierce heat of the oxyhydrogen flame; but such permanency, if purchased at the expense of inferior light, is too dearly bought, and will condemn the invention. Unless the inventors are acquainted with some peculiarities of zirconia unknown to those who are versed in the use of the limelight, and can by an unknown method bring out a light from the zirconia equal to that given by lime, the zirconia light, from an economi-

given by lime, the zirconia light, from an economical point of view, is a failure.

A few other experiments were tried, showing that soft lime and hard lime have to be placed at different distances from the blow-pipe nozzle to get the maximum amount of light from each. Chemical composition even more than hardness varies the amount of whiteness of the light. Magnesia cylinders were found to take a longer time to heat to whiteness and a longer time to cool than either lime or zirconia. Quartz rapidly vitrified under the flame, and asbestos could not resist the intense heat. It requires time and repeated heatings and coolings to test the permanency of zirconia under the oxyhydrogen flame to ascertain whether it does away with the necessity for clockwork apparatus. The piece used looked at the close of the experiments none the worse for the operations it had undergone, and a native zircon crystal, which, on previous occasions, Messrs. Darker had occasionally ignited under the oxyhydrogen

blow-pine, is now as hard as ever, having shown no blow-pipe, is now as narra as ever, having shown in tendency to crumble or soften like lime beneath atmospheric influences. The heat had produced in it traces of vitrification, which could be seen only by the aid of a lens.

# Regal Intelligence.

COURT OF EXCHEQUER.

June 19. (Sittings at Nisi Prius, after Term, before the LORD CHIEF BARON and a Special Jury.)

WRIGHT V. HITCHCOCK AND ANOTHER.

Mr. Grove, Q.C., Mr. Webster, Q.C., and Mr. Aston, were counsel for the plaintiff; Mr. Manisty, Q.C., and Mr. Macroy, appeared for the defendants.

This was an action brought for the infringe ment of letters patent, dated February 19, 1862, and granted to James Wilcox, for "improvements in the manufacture of frills or ruffles, and in the machinery or apparatus employed therein." The infringement complained of consisted in the sale of frills or trimmings which the plaintiff had obtained from a manufacturer in Glasgow, named Joseph Orr, and which the plaintiff, who was assignee of the patent, alleged to have been made by machinery like that patented. The defendants contended that the invention was not new, and that the more sale of the manufactured articles was not an infringement of a patent for ma-chinery; and, further, that if the article produced was claimed that ought to have been made the subject of registration under the Designs Act.

The Lord Chief Baron reserved the questions of law for the consideration of the Court. Upon the issues of fact, as to infringement and novelty, the jury found a verdict for the plaintiff.

## Correspondence.

PISTON PACKING.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—At page 438 of your last number, under the heading "Piston Packing," Mr. G. E. Donisthorpe, of Leeds, is credited with the invention there referred to. But any one who will take the trouble to refer to my specification, No. 931, April 3, 1857, will find, even relating to piston packings, all, and more than all, that is referred to at page 438 of your last number. As to the greeve fluid or water joint, I used that to keep the joints at the axes of my atmospheric condensers airtight, with a vacuum in them equal to from 22in, to 26in. of mercury, from 1842 up to 1850. Those packing boxes were packed with unspun hemp, and they would run for two years with the hemp metal as smooth as glass, and by occasionally screwing the gland down with the thumb and finger, and this water groove was a perfectly airtight joint. On the water sinking in the can that supplied the groove, the engine driver's attention These stuffing boxes occasioned very little resistance to motion, and gave little or no trouble. From 1852 until driven from my invention in 1857, I always used what may be called the bag fluid or water pressure to keep my steam valves to the cylinder face, against a pressure of 120lb. steam; from about the same time, the non-axial rollers were ever after used by me, and the steam valves without steam boxes were thus worked in equilibrium and the compound pressure borne by frictionless rollers; and in my specification No. 931 it is seen how this bag pressure is thrown upon the bag box or, as it is there called, the pressure box, so that all the pressure is sustained by the bag box or through the frictionless rollers, and can be thrown upon the back of the valves, as by the unscrew-ing or screwing up of two bolts to the extent of half an inch the pressure is all set on the valves through the rollers, or all taken off the valves on to the box; and the pressure can thus be in-creased or diminished at pleasure, even to an ounce, by the action of these two bolts and the arrangement there seen. In conjunction with this is my mode of having cold water, where desired, though it be in free communication with steam of 400lb. pressure. This I used from 1842, in conjunction with my regulating damper. But the bag form is not essential, as I as often used india-rubber cloth as the bag.—I am Sir, yours, &c.,
THOMAS CRADDOCK.

Birmingham, June 22.

#### TO CORRESPONDENTS

THE MECHANICS' MAGAZINE is sent post-free to subscribers of £1 ls. 8d. yearly, or 10s. 10d. half-yearly payable in

of £1 is. 8d, yearly, or 10s. 10d. half-yearly. payable in advance.

All literary communications should be addressed to the Editor of the MECHANICS' MAGAZINE. Letters relating to the advertising and publishing departments should be addressed to the publisher, Mr. B. Smiles, MECHANICS' MAGAZINE.

To insure insertion in the following number, advertisements should reach the office not later than 5 o'clock on Thursday evening.

We must absolutely decline attending to any communications unaccompanied by the name and address of the writer, not necessarily for insertion, but as a proof of good faith. Ed. M.

Advertisements are inserted in the MECHANICS' MAGAZINE, at the rate of 6d. per line, or 6d. per line for 13 insertions, or 4d. per line for 26 insertions. Each line consists of about 10 words. Woodcuts are charged at the same rate as type. Special arrangements made for large advertisements.

BARRANS' STEAM HAMMER.—In the description of the

as type. Special arrangements made for large adverusements.

BARRANS' STEAM HAMMER.—In the description of the single standard self-acting steam hammer, by Messrs. J.

BARRANS and Co., which appeared in our issue for the 28th May last, the address of the firm was wrongly given as the Steam Hammer Works, Whitehall, Shemeld." It should have been "Whitehall-road, Leeds."

RECEIVED.—G. W. B.—H. L.—C. D.—F. A. D.—H. S.—R. T. G.—H. N.—C. F.—B. H. and Co.—R. W.—J. C.—B. B. and Son—J. A. B. and Co.—R. S.—E. J.—G. G.—F. C. D.—T. C.—W. T. F.—B. and D.—E. M.—B. and D.—J. P.—R. S.—M. and Sons—R. H. G.—S. C. and Co.—G. E.—H. D.—R. S. F.—J. B.—E. W. B.—A. N.—H. E.—G. W.

## Meetings for the Beek.

Mon.—Boyal United Service Institution.—Major Fosbery,
V.O., Bongal Staff Corps, on "The Future
Position of the Mitrailleur, or Machine Gun, in
War," at 8.30 p.m.
SAT.—London Association of Foremen Engineers.—HalfYearly Meeting. The Accounts will be
Andited, and the Election of a New Committee
will take place, at 8 p.m.

# Rabal, Military, and Gunnery Items.

A PARLIAMENTARY return shows that the number occurred in the British merchant service during the year 1868 was 5,237. In 1867 the number was

THE Bermuds iron floating dock left the Medway on Wednesday morning for her destination in tow of the "Terrible" and several smaller steamers. She will be towed through the Channel by the "Agincourt" and the "Northumberland," and afterwards taken in tow by the "Warrior" and other steamers. other steamers.

FROM the annual account of the Mercantile Marine FROM the annual account of the Mercantile Marine Fund we learn that £359,738 was received for light dues in the year 1868. The year's expenditure for maintenance of the lighthouses of the United Kingdom, and of vessels and establishment, amounted to £305,325, and for new works and buildings, £47,063, making together £352,388.

A STRONG party of B troop, Royal Engineer Train, are at Wimbledon preparing the camping ground and rifle ranges for the ensuing volunteer gathering. Admiralty sanction has been given for a certain number of mon belonging to the various divisions of the Royal Marines to compete for the Army and Navy Challenge Cup presented by the National Rifle Association.

The terrible destructiveness of the Armstrong The terrible destructiveness of the Armstrong segment shells now in use in the British army when fired direct into columns of troops was remarkably shown in Tuesday's proceedings at the Dartmoor trials which are now exciting so much interest in military circles; the 12-pounder segment shells having in fifteen rounds planted no less than 949 hits upon the six rows of targets, representing six companies of soldiers of the line advancing in quarter-distance column to deploy.

GENERAL GILMORE has been ordered to Savannah GENERAL GILMORE has been ordered to Savannah to superintend repairs upon Fort Pulaski, which he bombarded and almost destroyed on April 10 and 11, 1862. The work was sixteen years in building; it cost about 1,000,000dols. The Savannah "News" thinks it useless to repair the fort. The missiles from the rifled cannon of Gilmore crashed through its walls, although 7½ft. thick, with almost as much ease as a rifle bullet could be shot through butter, and the rifled gun of to-day is much more powerful than those whose penetrative power created so much than those whose penetrative power created so much astonishment in 1862.

Considerable interest was excited in February CONSIDERABLE interest was excited in February last by the fact of the Cunard steamship "Russia." Captain J. Cook, and the Inman steamer "City of Paris," Captain Kennedy, both iron screw vessels of great speed, having left New York for Queenstown on the same day, and within a short time of each other, and heavy bets were made in Liverpool on the result. The "City of Paris," on that occasion, gained 42 minutes on her great rival, she having made the voyage across the Atlantic in 8 days



19 hours, 23 minutes, and the "Russia," in 8 days 20 hours, 5 minutes, the distance from New York to Queenstown being about 2,855 miles.

A BOARD OF TRADE return, probably intended to be annual, shows that the deaths of 5,237 seamen in be annual, shows that the deaths of 5,237 seamen in the British merchant service were reported to the Board of Trade in 1868, a rather smaller number than in 1867. 2,926, more than half the whole number, were drowned, 1,785 of them in wrecks; 28 committed suicide, 26 died of sourvy, 546 were carried off by fever, 175 by cholera, 216 by dysentery, 100 by diarrhesa, inflammation, &c.; 2,111 were between 20 and 30 years of age, 1,935 were able seamen. The return includes some deaths in British colonial ships; it contains, also, many, if not most, of the cases of men who die under similar circumstances in the United Kingdom.

The "Monarch" was taken into dock at Ports-

THE "Monarch" was taken into dock at Portsmouth, last Friday, for the purpose of having her hull below high-water line cleaned and recoated with an anti-fouling compound. For the purpose of with an anti-fouling compound. For the purpose of testing the qualities of various compounds, her hull was coated with them some twelve months ago, and, since that time, she has been lying in the Medway. Upon the water being pumped out, nearly the whole of her sides were found to be covered with crustaces, windled with wavely recentation. of her sides were found to be covered with crustacea, mingled with varied vegetation. A part, however, was singularly free from any such encrustation. It had been coated with a composition invented and patented by Dr. Sim, who appears to have brought his efforts in this extremely important matter to something very near perfection. We understand that the Admiralty have arranged with Dr. Sim to have the whole of the hull of the "Monarch" below high wrater line coated with his composition high-water line coated with his composition.

The Board of Trade have made the following awards:—A binocular glass to Captain J. Figaret, of the French ship "Clotilde of Cette," for having rescued the master and crew of the barque "Martha or the French snip "Clothids of Cette," for naving rescued the master and crew of the barque "Martha Kay," of Whitby, from their sinking vessel, when in latitude 29-22deg. N. and longitude 39deg. W., on July 18, 1868. A telescope to Captain John Winsor, of the brig "Magic," of St. John's, Newfoundland, for having rescued the master and crew of the brig "Othello," of Greenock, on February 4, 1869. The "Magic" fell in with the "Othello" in a disabled state on February 3, but owing to the heavy sea no assistance could be rendered till the following day, when the crew were taken on board, after being verykindly treated, and were landed at St. John's on February 28. A binocular glass to Captain T. G. Wragge, of the brig "Delphin," of Oldenburgh, for his humane services to the master and crew of the brigantine "Rosebud," of Truro, which vessel was abandoned on January 29, 1868, in the Mediterranean, in a sinking condition. The rescued crew were put on board a pilot boat off the Lizard, after having received every kindness whilst on board the "Delphin."

# Miscellanea.

A PATENT has been obtained in America for the manufacture of waterproof paper. It will be no uncommon thing, by and by, to carry a quart of milk home in a paper bag.

THE death is announced at Cheltenham of Mr. Charles Sturt, formerly of the 39th Regiment, one of the earliest explorers of the Australian continent, and subsequently Colonial Secretary of South Australia

It is believed that the statement from Honduras in the New York papers of a survey of "the Honduras Interoceanic Railroad" having been made by a Mr. Robert Fitzroy, at an estimated cost for its construction of 1,885,000dols., is entirely without foundation. The Government line is being actively considered by Massey Waring and MyCandlish carried out by Messrs. Waring and M'Candlish.

Last Friday afternoon, Mr. Layard, M.P., Mr. Cowper, M.P., Mr. Barry, Mr. Woolner, and others, made a formal inspection of the new statue of Lord Palmerston, which has been placed on the northern green plot of ground facing New Palace-yard. It has not yet been decided whether the statue shall permanently occupy its present site.

It is stated that Mr. Robert H. Sayre, Chief Engineer of the Lehigh Valley Railway, with a number of prominent iron manufacturers, are making preparations for a trip to England for the purpose of studying the process of manufacturing steel rails. They sail on June 22. On their return they will establish a manufactory of this kind at Bethlehem, the construction of which has already begun.

NEAR the ancient city of Aix, formerly the capital town of Provence, but now in the department of the Bouches du Rhone, an important agricultural meeting came off last week. The main feature of interest was the competition in ploughs and subscilers. The French makers put forth all their strength, but in both cases, after an exciting contest, they had to succumb to their English rivals, the Howards, of Bedford, who carried off both gold medals, and the money prize as well.

SINCE Monday last, the public are now admitted to the prize works of the schools of art of the United Kingdom submitted in national competition. These works contain many designs for manufactures, which producers will find it useful to consult. The works are exhibited in the galleries overlooking the Horticultural Gardens, for want of space in the South Kensington Museum.

The thirty-fourth half-yearly meeting of members of the London Association of Foremen Eugineers is appointed to take place at the City Terminus Hotel, on Saturday, the 3rd proximo. On this occasion the accounts will be audited and the election of a new committee will take place. The chair is to be taken, at 8 p.m., by Mr. J. Newton, president.

THE number of visitors to the South Kensington Museum during the week ending June 19, 1869, was—on Monday, Tuesday, and Saturday (free), from 10 a.m. to 10 p.m., 11,972; Meyrick and other galleries, 2,361; on Wednesday, Thursday and Friday (admission 6d), from 10 a.m. till 6 p.m., 2,231; Meyrick and other galleries, 197; total, 16,761. Average of corresponding week in former years, 16,912. Total from opening of Museum, 8,535.026.

A THEATRICAL and musical entertainment in aid of the funds of the Printers' Orphan Asylum will of the funds of the Printers' Orphan Asylum will take place at the Olympic Theatre to-morrow (Saturday), when Mr. Mark Lemon will represent the character of Sir John Falstaff, in selections from Shakespeare's historical play of "Henry IV.," to be followed by a miscellaneous concert, in which several talented vocalists will appear. The whole to conclude with the admired farce of "Good for Nothing;" characters by a distinguished company of amateurs, assisted by Miss Rose Garland.

THE committee for the affairs of the kingdom of Poland, presided over by Prince Gagarine, has under examination three projects emanating from Count Tolstoi, Minister for Public Instruction, relative to the transformation of the High School of Warsaw into a Russian University, to the foundation of an agricultural institute at Pulawki (New Alexandria), and to the transformation of the technical gymnasium of Lodgi into a technological institute. and to the transformation of the technical sium of Lodzi into a technological institute.

THE Tower Subway has now passed the nearest approach to the bed of the river, the top of the tunnel being 23tt. below the bed, and the engineer, Mr. Peter W. Barlow, jun., reports that, at the present rate of progress, the tunnel will reach highwater mark on the Surrey side in ten weeks. The ground, it is said, is so dry, that the New River Company's water laid on the works has to be taken from the shafts for the cement used in the tunnel. Air is supplied to the men by a steam engine at the shafts. Communication between the men at the face of the works and the top of the shafts is effected by electric telegraph. electric telegraph.

As an instance of the facilities afforded to modern journalism by steam and electricity, it is worth noting a feat performed by a provincial contemporary on the occasion of the division in the Lords on Saturday last. The "Western Mail," the new daily paper for the West of England and Wales, published a double number, with the result of the division, a leading article upon it, and a special report of the Friday night's debate—several columns long—three hours after the division in the House of Lords at Westminster in time for delivery in the West and disposal.

Amongst the various causes to which the present cold weather at Midsummer has been attributed is the fact that at this moment the disc of the sun has an unusual number of spots. The "Giornale di an unusual number of spots. The "Giornale di Roma" publishes a communication from the celebrated astronomer, Father Secchi, on this subject, in which that savant says:—"The sun is, at this moment, at a period of an unusual prevalence of spots. On the morning of the 7th, 33 principal ones were counted, disposed in seven or eight groups. Their number is rapidly approaching a maximum. The whole surface of the luminary is covered with them, and it appeared to us several times to present the aspect of a mass of white flakes on an ash-coloured ground."

With a view of deciding whether the Shropshire and South Staffordshire coalfields are connected by a third coalfield underneath the new red and permian, the South Staffordshire and East Worcestershire Institute of Mining Engineers are now completing arrangements by which all doubt about it will be set arrangements by which all doubt about it will be set at rest. Proposals are nearly concluded for putting down one or more large bore holes in the intervening country, and it is confidently expected that if the landowners and others interested in it will take it up with the same spirit as the large body of practical engineers are promulgating the scheme, at the end of this year considerable progress will have been made towards the attainment, if not the completion, of so desirable an object. There is no subject of greater commercial and social importance to the Black Country than the discovery of coal in the immense tract of country lying between the two coalfields.

# Patents for Inbentions.

#### ABRIDGED SPECIFICATIONS OF PATENTS.

CIE Abridged Specifications of Patents given below are classified, according to the subject to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are, therefore, the property of the Proprietors of this Magazine. Other papers are hereby warned not to produce them without an acknowledgment:—

warned not to produce them without all acadowiedgement:—
BOILERS AND FURNACES—3684, 3699, 3701, 3710
BUILDINGS AND BUILDING MATERIALS—3697, 3703, 3725
CHEMISTRY AND PHOTOGRAPH—3695, 3712, 3714, 3722
CULITVATION OF THE SOIL, including agricultural implements and machines.—3688, 3698, 3705, 3706
ELECTRICAL APPARATUS—None
FIBROUS FABRIOS, including machinery for treating fibre, pulp, paper, &c.—3686, 3698, 3700, 3712, 3729
FOOD AND BEVERAGES, including the apparatus for preparing food for men and animals—3707, 3716
FURNITURB AND APPAREL, including household utensils, time-keepers, jowellery, musical instruments, &c.—3690, 3696, 3726, 3730
GENERAL MACHINERY—3685, 3719
LIGHTING, HEATING, AND VENTILLATING—3698, 3715, 3718
METALS, including apparatus for their manufacture—3704
MISCRILLANEOUS—3687, 3691, 3692, 3695, 3713, 3724, 3727, 3728

3728
ROADS AND VEHICLES, including railway plant and carriages, saddlery, and harness, &c.—3702, 3717, 3721, 3723
SHIPS AND BOATS, including their fittings—3694
STEAM ENGINES—3708
WARFARE—3709, 3720

3684 H. KINSEY, Nottingham. Botters. Dated Decem-

3684 H. KINSEY, Nottingham. Botters. Dated December 3, 1868.
In constructing steam boilers, the inventor employs corrugated plates of metal, connected together in pairs, the ridges of one corrugated plate being connected to the ridges of the other corrugated plate by rivets or screw stays, so that the space between the plates may form a water space of the boiler, and the fastenings which connect the plates together must be sufficiently strong to withstand the pressure within the waterspace. The ridges of two plates may be brought into contact, but he prefers that they should be kept at a short distance from one another by distance pieces.—Patent completed.

Patent completed.

3685 W. SIMPSON and J. HUTTON, Northampton. Lubricating apparatus. Dated December 3, 1868.

This consists in applying to the inner end of the valve spindle a conical head or valve, and in forming on the inner end of the tube, through which the spindle passes, a correspondingly shaped valve seat, against which the said valve fits when the lubricator is not in action. The conical valve is applied to its spindle by cutting a screw on the latter, which passes through a female screw in the former, so as to allow of the adjustment of the said valve on its spindle, as required.—Patent abandoned.

3686 W. R. LAKE. Southampton-buildings. Kritting

former, so as to allow of the adjustment of the said valve on its spindle, as required.—Patent abandoned.

3868 W. B. LAKE, Southampton-buildings. Knitting machines. (A communication). Dated December 4, 1868. This relates to a machine in which the knitting is accomplished by the action of a series of teeth (projecting from the periphery of a rotating disc or wheel) and a reciprocating needle in combination with a looper, which takes the yarn or thread from the needle to form the stitches upon the teeth, and a stripper which removes the stitches as they are formed. The rotating plate or wheel which carries the series of teeth is fitted to turn on a stud or pin, which is fixed in the centre of a ring, forming a part of the frame of the machine. The frame is extended on one side of this ring, and is provided with a bracket and clamping screw, whereby it may be conveniently secured upon a table or other support. The disc or plate is geared in connection with a toothed pinion, which is caused to act with an intermittent motion like a ratchet wheel, by means of a rod attached to an eccentric which is carried on the main spindle.—Patent completed.

3687 W. B. LAKE, Southampton-buildings. Culting edible roots. (A communication). Dated December 4,1868.

This consists of a frame or stand, the upper part of which is encased; also of a shaft revolving in bearings in the frame. A balance wheel is attached to one end, and to the other end is attached the crank or other means for communicating power to the machine. A hollow cylinder open at one end is rigidly attached at the other end to the shaft, so as to be carried with the shaft in its revolution. The drum or shell of the cylinder is formed with three inclined slots extending from end to end, these slots inclining or curving towards the centre of the cylinder as they pass through the case or drum.—Patent completed.

3688 H. ROBINSON, Lewisham. Dressing millatone.

pass through the case or drum.—Patent completed.

3688 H. ROBINSON, Lewisham, Dressing millstone, Dated December 4, 1868.

This relates to machines for forming curved or convolute lines or cracks on the surface of millstones, and consists in causing the lines or cracks near the periphery or skirt of the millstone to be wider spart or coarser than those near the centre, so that the wear on all parts of the stone will be equal, thus obviating the existing disadvantage of the surface near the periphery of the stone wearing away before the surface near the centre thereof, by reason of the difference in the speed of the various portions of the surface.—Patent completed.

2688 S. Hussur Glescow. Purious, Dated December 4.

3689 S. HIRSCH, Glasgow. Dyeing. Dated December 4,

1868.
The mechanism or apparatus is composed of a shaft, supported horizontally in bearings, fixed in the sides of the dye boiler, and in which it is capable of being revolved. At or near the centre of the shaft a disc is carried, on either side of which sets of rectangular frames are placed. On these frames, hanks or skeins are hung in an unstretched state, the frames being less in breadth than the length of the hanks or skeins. The frames are, by preference, placed radially to the central shaft, but they may be placed obliquely thereto, and although they may be con

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structed without openings in the inner part, yet it is preferred to make them with openings somewhat after the manner of a trellis, thus serving to keep the yarn in order without stretching it, by not allowing it too much play; or sets of three or more sticks may be fastened to the disc, to serve in the same manner.—Patent completed.

disc, to serve in the same manner.—Fatent completed.

3690 R. CHARLES, Birmingham. Thimbles. Dated December 4, 1868.
This consists in lining thimbles with glass, which may be effected in various ways, such as making the metal, or compound metal outer casing of the thimble a mould or matrix, and applying an internal plunger, leaving a sufficient space for the glass, the latter being in a soft state during the time it is being pressed into the interior of the metal or outer casing; or the glass lining may be on the exterior, the exact shape and dimensions of the internal form of the metal casing, the glass lining being held or retained by the outer or metal portion of the thimble, being lapped or spun over it (operations well-known) so as to retain the glass and form a bead around the open part of the thimble.—Petent abandoned.

3691 J. H. JOHNSON, Lincoln's Inn-fields. Cures of

as to retain the glass and form a bead around the open part of the thimble.—Patent abandoned.

3691 J. H. JOHNSON, Lincoln's Inn-fields. Cures of diseases. (A communication.) Dated December 4, 1868.

This relates to a peculiar mode of treating diseases, and to apparatus employed therefor, and consists essentially in enclosing the patient in a main airtight receiver, provided with a close fitting cover and removable front or shell, the joints being packed tight with india-rubber, the shell or front being further secured whon adjusted in position by any convenient fastening. If desired, glazed windows may be provided for enabling the progress of the treatment to be inspected by the medical attendant. The neck of the patient passes through a ring packed with an india-rubber cap or hood, which encloses the head, leaving the face only exposed. An air inlet valve is provided for admitting fresh air, when required, into the receiver, which is furnished with a vacuum gauge and flexible air tubes in connection with an air pump, as also with electrical wires for the application of electricity to the patient when requisite. In conjunction with this main vacuum receiver are employed other auxiliary receivers for the reception of the limbs, whilst the patient is still within the main receiver, such auxiliary receivers enabling an increased vacuum to be applied to any of the limbs, if requisite.—Patent completed.

3692 J. C. ROLLINS, Upper Thames-street. Nozzles. (A communication.) Dated December 4, 1862

requisite.—Patent completed.

3692 J. C. ROLLINS, Upper Thames-street. Nozzles. (A communication.) Dated December 4, 1868.

The nozzle is formed, by preference, of thin metal spun up into a screw, and a screw cap is applied thereto, which is made in a somewhat similar manner, but instead of leaving the bottom of the nozzle open to the can or other vessel, a piece of thin metal is fixed at the bottom thereof, which may be readily removed by a knife or other suitable means, when it is desired to pour out the contents of the can or other vessel.—Patent completed.

3693 W. G. AINSLIE East India Avenue. Draing peat.

can or other vessel.—Patent completed.

3693 W. G. Annslis, East India Avenue. Drying peat, &c. Dated December 4, 1863.

The inventor places the peat or other materials to be dried one open trays or shelves, leaving spaces all round for the passage of air, as is now commonly practised. These trays or shelves are carried by waggons or "lorries," provided with cranked axles, so as to facilitate the use of large, or comparatively large, wheels, and thereby render the traction more easy, and at the same time permit of the waggons or lorries being made to it, or nearly fit, the sectional area of the drying shed through which they have to pass.—Patent completed.

3694 M. P. W. BOULTON, Lew Park, and J. INRAY.

waggons or lorries being made to fit, or nearly fit, the sectional area of the drying shed through which they have to pass.—Patent completed.

3694 M. P. W. Boulton, Lew Park, and J. Imray, Westminster Bridge-road. Rotary propellers, &c. Dated December 4, 1868.

This relates to rotary apparatus for the propulsion of vessels, the object being to construct propellers capable of as easy revorsal as the screw or paddle, and of superior efficiency. It also relates to rotary apparatus of a similar kind for pumping or forcing liquids or aeriform fluids. One form of propeller is constructed as follows:—The inventors mount a wheel on an axis transverse to the length of the vossel. This wheel consists of a contral dilsc or cylindrical core, furnished with blades projecting from it, and works freely within a cylindrical casing. On either side of the wheel are guiding passages, two sides or boundaries of which are portions of cylinders, the outer one being a continuation of the cylindrical casing in which the wheel works, while the inner one is of the same diameter as the disc or cylindrical core of the wheel. Each of these guiding passages is open on one side to the blades of the wheel, so as to afford a free passage for the water to them, and is bounded on the opposite stire by a helicul surface. The positions of the helical guides and the width of the space between them in which the wheel wolks are so adjusted that if one of the helices were prolonged with a uniform curvature, it would join the other and form a continuous screw thread throughout. The guiding passages thus formed are united tangentially with passages directed fore and aft respectively, which open into the outer water as directly or conveniently as possible.—Patent completed.

3605 H. L. Mansden, Louth. Photographic prints. Dated December 4, 1868.

This consists of one or more receptacles or vessels for containing the toning or fixing solutions, or water or other liquid, in which the photographic prints or other articles to be prepared are immersed, and s

of water or other liquid.—Patent abandonod.

3696 J. S. CAPELLE, Paris. Perpetual calendar. Dated December 4, 1868.

In the calendars hitherto used a second readjusting knob was indispensable to bring back the date to the first day. By this method, when the date finishes, it recommences by the same knob and always by the same motion, of the cylinder and toothed gearing. This method is not only applicable to desks, but also to inkstands, bookcases, console tables, and other articles of furniture.—Patent completed.

to a great extent prevented from passing into the trap. The mud box, with which is cast a second vessel, contains the mid-feather, which constitutes the ordinary trap, and within which the inventor places a grid; upon a continuation of the mid-feather is cast a lug to which is hinged a dead plate formed in the same piece with the usual grid, and the plate rests at its inward end upon a mid-feather extending across the box. thereby forming a trap which is provided with a grid. The upper part of he box is formed with a projecting part, against which if the apparatus be applied to a street) the paving stones are set, and they are thus prevented from pressing against the end of the grid and sides of the face, and these parts may therefore be readily turned upward on their centre. The bottom of the mud box is inclined backwards.

—Patent completed.

3698 A. C. SIERBEN and J. LAMBE, Rotherhithe. and J.

3698 A. C. STERRY and J. LAMBE, Rotherhithe, and J. FORDERE, Blackheath. Purifying parafin. Dated December 4, 1868.

bor 4, 1868.

This relates to a novel mode of treating and purifying paraffin in the condition of loose crystals, the object being to expedite and economize the operations of separating the crystals from the fluid with which they may be naturally or otherwise associated, and of washing and drying the crystals. To this end, the inventors first submit the mixture of paraffin and oil to the action of a centrifugal apparatus acting on the principle of what is known as the hydro-extractor, by which means the solid paraffin is separated from the oil, the paraffin being retained within the apparatus, and the liquid or oil passing away through the pervious sides of the same in obedience to the centrifugal law.—Patent completed.

obedience to the centrifugal law.—Patent completed.
3699 J. R. SWANN, Edinburgh. Kiins. Dated December 4, 1868.
In order to obtain a more perfect combustion of fuel without smoke, and with economy of labour, movable or travelling firebars are applied to kiins. The firebars are received into a chamber at the bottom of the kiin, over which a dry limestone arch is turned through the openings or crevices in which the heat from the fire passes up into the kiin.—Patent completed.

· 3700 E. Francillon, Puteaux. Dyeing. Dated December 5, 1868.

by the frakeninon, Fucaux. Dying. Dated December 5, 1868.

Having cleansed the furs or hair thoroughly in any convenient manner from all extraneous substances which may have been used to remove the grease from the fur or hair, the inventor washes well in water rendered slightly alkalino. After having well washed in plenty of water, he drains the fur or hair and brushes it over with, or steeps it in, a solution prepared as follows:—17oz. of water is taken, and chloride of potash 4dr., chloride of ammonium 14dr., nitrate of antiline 15oz., and sulphate of copper 4dr., added to it. To give the bath a greater density, he uses tapicca as a thickening. In the case of detached fur or hair, the solution may be used as a bath, the fur or hair being steeped in it.—Patent completed.

the fur or hair being steeped in it.—Patent completed.

3701 J. A. FAWCETT, Wakefield. Supplying furnaces with jud. Dated December 5, 1868.

This relates to a patent, dated April 20, 1868, No. 1231.
The present improvements consist in the application to each of these holes of a hopper with a conical valve or stopper fixed on a spindle or rod on which may be a handle at the top for lifting same; also another conical stopper is fixed at the bottom end within the furnace, the two cones having their apexes upward, and so arranged that when the upper one is closed to the hopper the bottom one is open or not in contact therewith, but when raised, the top one is open to admit a quantity of fuel to drop under it, the bottom cone being closed, so the opening prevents the fuel passing until the valves or cones are dropped, when the quantity thus admitted below the top valve passes through the opening, the bottom cone distributing the same upon the fire of the furnace.—Patent abandoned.

3702 B. HUNT. Searle-streat. Wheels the communication of the communication.

abandoned.

3702 B. Hunt, Searle-street. Wheels. (A communication). Dated December 5, 1868.

This consists in the application of vulcanized caoutchout to the wheels of railway carriages and other articles of like description.—Patent abandoned.

This consists in the application of vulcanized caontchoud to the whoels of railway carriages and other articles of like description.—Patent abandoned.

3703 D. Thompson, Johnstone. Sawing machinery, Dated December 5, 1863.

The main framing of the machine is a table or bench of iron, cast in one piece, the circular saw, too, being arranged to work up through a slot in the top of it in the usual way. There are two pairs of vertical feed rollers, and each pair is held in an upper frame, which is movable horizontally on a lower slide, adjustable horizontally upon guides fixed to the main framing. Levers, carried on contress on the lower slides, serve to press the upper frames towards each other, so as to make the rollers grip the deal or batton passing between them. One lever acts directly against the inside of the inner flange of its upper frame, and this lover is made with a horizontal arm, to which a weight is applied. The other lever acts on its frame through a small horizontal lever to reverse its motion, and has its bottom connected by an adjustable screw rod to the bottom of the other lever, so that the one weight acts equally on both levers and ensures the holding of the deal or batten accurately in the centre. The lower slides are adjusted by horizontal screw spindles, which are geared together by equal spur wheels, so as to move the slides equally to or from the centre line. One of the spur wheels is connected to its spindle by a cone clutch, that is to say, it is formed with a conical eye to fit a conical boss on the spindle, on which it is diphtened by a two-handled screw nut, so that it can be loosened when it is wished to adjust the slides independently of each other. The spindles of the feed rollers project downwards, and have bevel wheels on their lower ends in gear with bevel wheels on their lower ends in gear with bevel wheels on their lower ends in gear mith bevel wheels on their shorts that, fitted with, affirently sliced pulleys, to receive a belt from the shaft of the circular saw.—Patent com

completed.

3697 F. Beech, Salford. Gulleys. Dated December 4, 1868.

This consists in an arrangement of gulley or stench trap, and mud box, whereby the inventor is enabled to clean the same without breaking up the street, if it be so applied, and by which the mud and other solid matter is

and resinous matters used in making sheep smear Patent completed.

Patent completed.

3705 H. DENTON, Wolverhampton. Chain harm.
Dated December 5, 1868.

Upon a pair of travelling wheels he mounts if rame and pole, or a pair of horse shafts. Upon the axle of the wheels, or upon a transverse shaft parallel with the axle, he fixes or fits a barrel or drum to rotate with the axle, to run loose upon the parallel shaft, which barrel or drum is made to revolve by a clutch coupling or gearing connecting it with one or both of the travelling wheels. A stop plate or slide is also provided for fixing the drum in position, which is formed and operates as havenafter described. To this barrel or drum one end of the chain or jointed harrow is attached, so that the whole or any portion thereof can be wound up as required.—Patent completed. completed.

portion thereof can be wound up as required.—Patent completed.

3706 E. K. DUTTON, Manchester. Gig mills. (A communication). Dated December 5, 1868.

On each side of the centre of the raising cylinder is mounted a frame, carrying at one end a leading roller, the other end swivelling around a centre or falcrum. These frames being fitted with nuts, on which work screw shafts, cut right and left hand, the arrangement being such as that the two frames may approach each other, or may recede therefrom, according as the said screw shafts are turned in one direction or the other. An intermediate leading roller is mounted in bearings capable of being moved towards or from the centre of the cylinder, and in the direction of the centre line of the said cylinder or thereabouts, each one of the said bearings being operated upon by a screw, and the two screws being connected together by a shaft, fitted with bevel wheels gearing with corresponding wheels fixed to the screws. Each of the aforesaid frames carries a set of three guide rollers, over which the cloth is passed in order to break the contact with the cylinder, two other guide rollers being employed to guide the cloth on the intermediate leading roller, each of which swivels upon a centre fixed to or carried by the contiguous swivelling frame, the other end being connected by means of a link to one of the bearings of the intermediate leading roller, so that the motion of the said guide roller is governed both by the swivelling frames and by the said intermediate leading roller,.—Patent completed.

3707 A. V. Newton, Chancery-lane. Flour. (A communication). Dated December 5, 1868.

pleted.

3707 A. V. Newton, Chancery-lane. Flour. (A communication). Dated December 5, 1868.

The object of this invention is to fit the flour asit comes from the millstones for being immediately dressed through silk. For this purpose it is necessary to extract from the flour the moisture which it contains, and at the same time to reduce the temperature of the flour to that of the air in the mill. To attain this end, a novel arrangement of apparatus is employed, in which the flour is discharged down an air channel. It is met by an upward current of air, as has heretofore been proposed, but by this apparatus the flour is effectually prevented from escaping into the mill or obstructing the escape of the air and moisture.—Patent completed.

3708 A. Masson. Edinburgh. Steam engines. Dated.

moisture.—Patent completed.

3708 A. Masson, Edinburgh. Steam engines. Dated December 5, 1868.

This relates to mechanism whereby the ordinary, or other suitable governor, is made to act on a double-beat or equilibrium valve, so as to vary the durations of the admissions of steam to the steam or valve cheat of a steam engine. The movement for opening the equilibrium valve is derived from the crank shaft, or other conveniently moving part of the engine, and is transmitted through a catch lever or intermediate piece, hereinafter termed the catch, which, whilst moving in the direction to open the valve, is also made to move laterally by the action of an incline, or its equivalent, until it escapes off the end of the bar acting on it, whereupon it allows the water to close the valve, always opening again at the commencement of the succeeding stroke. The part acting on the incline is shifted by the governor, so that the escape takes place at a later or earlier period, in accordance with the action of the governor.—Patent completed.

3709 J. Abraham, Birmingham. Central-fire cartridges.

escape takes place at a later of earlier period, in accordance with the action of the governor.—Patent completed.

3709 J. ABRAHAM, Birmingham. Central-fire cartridges. Dated December 5, 1868.

The inventor makes the chamber to receive the anvil and percussion cap of a cylindrical figure and in one piece with the head of the cartridge case, the sides of the chamber being made of a double fold of the metal of the head. A hole, of a size proper to admit the percussion cap to be used, is made in the centre of the said head. The anvil, hereinafter described, is introduced into the chamber from the open end or mouth of the cartridge case, and the chamber is closed upon and made to retain the anvil. The chamber is made by pressing or shaping by dies, and pressing a deep annular groove or depression in the flat part of the head. A portion of the metal of the head is thereby forced into the interior of the powder case, the double fold, described, of the chamber being at the same timo produced. The anvil hereinbefore referred to consists of a conical block of metal having in its axis a hole or passage, and in its base, and concentric with its deep axis, a deep groove or depression, of a size proper to receive an ordinary percussion cap.—Patent abandoned.

3710 J. HOLMES, Bradford, Kilns. Dated December 5

3710 J. HOLMES, Bradford, Kilns. Dated December 5, 1868.

The kilns are constructed as follows:—An annular smoke chamber is built around the chimney in the centre of the kiln, and communicates with the said chimney, by means of flues formed in the wall thereof. Permanent radial division walls are built in the kiln, which walls extend from the smoke chamber to the outer wall of the kiln, and divide it into firing compartments or chambers, in which the goods to be fired are placed. Flues are made in the said division walls to connect one chamber with another, and other flues are made in the wall of the smoke chamber to connect it with the firing chambers of the said flues, being closed, as required, by means of sliding dampors. Firing holes are formed in the outer wall of the kiln, and other holes (provided with covers) are formed in the top of the kiln, for the purpose of allowing steam to escape during the first stage of burning goods, and inserting fuel during the last stage of burning goods, and inserting fuel during the last stage of burning copenings or wickets (large enough to admit a horse and cart) are made in the outer wall of the kiln, one to each chamber, through which openings the goods are taken into and out of the kiln.—Patent completed

3711 B. FOWLER, D. GREIG and R. BURTON, Leeds.
Steam cultivating machinery. Dated December 5, 1868.
In order to lift the times or tilling tools of cultivating



implements out of the ground, to enable the implement to implements out of the ground, to enable the implement to turn, and also in order to turn the implement, the inventors mount upon it on an axis a lever. to which, at its free end, the hauling ropes, for drawing the implements to and fro, are attached. When the implement has arrived at the end of its course, and what was the slack rope becomes the draft rope, the first action is to cause the lever to move round, and a pulley upon its axis then winds up a chain passing to a quadrant on the axie of the carrying wheels of the implement. The axie is thus turned partly round, and being cranked at the ends where the wheels are carried by it, the wheels are thus depressed in respect to the frame of the implement, or, in other words, the frame with the tines or tilling tools is raised.—Patent completed.

3712 D. H. PATERSON Spencefield. \*\*Rianking.\*\* Dated

3712 D. H. PATERSON, Spencefield. Bleaching. Dated December 5, 1868.

3712 D. H. PATERSON, Spencefield. Bleaching. Dated December 5, 1863.

This consists in the use of one or more chest or chests made of iron or other similar material. The chest must be of sufficient strength to sustain a pressure of, at least, 10lb, weight to every square inch of its surface, and is furnished with a lid or cover, to be screwed down upon it and made steamtight by means of a gashet or other steamtight joint. The lid may be lifted off the chest by means of a travelling crane, and one lid or cover may thus be made to serve for more than one chest. The chest must be lined with lead, or other anti-corrosive material, in order to prevent any chemical action by the bleaching or dyeing solution employed upon the iron, or other material, of which the chest is constructed.—Patent completed.

3713 W. B. LAKE, Chancery-lane, Removing stem from printers' type. (A communication.) Dated December 5, 1868.

This consists of a stock or frame by which the apparatus is attached to a printers' type casting machine in such a position with reference to the mould as to catch or receive the newly cut type immediately after it is discharged from the mould. In the upper surface of the stock is formed a gutter for tho type to descend in vertically; through the gutter is cut a hole into which is fitted an adjustable plug attached to a right-angled lever working on a centre pin, which, when drawn back, lets the broken-off jet of type-metal escape while the upper sildes down the gutter to escape from the end of the apparatus. This plug is kept in its place by a spring. There is a sliding adjusting plate secured to the face of the stock by set screws, working in slots in the plate.—Patent abanby set screws working in slots in the plate.-Patent aban

by set screws working it stock that the doned.

3714 A. M. CLARK, Chancery-lane. Disinfecting sewage.
(A communication). Dated December 5, 1868.

This relates to the manufacture of double phosphate of magnesia and iron, and also to the application of the same for the treatment of sewage waters and other similar matters, and for disinfecting and enriching the residuum of said waters or matters.—Patent completed.

of said waters or matters.—Patent completed.

3715 A. B. Berre Patent Completed.

3716 A. B. Berre Patent Manufacturing gas. Dated December 5, 1868.

The coal, wood, turf, or other suitable fuel employed, is introduced through the upper opening provided with an hydraulic bell or cover into a tube widening out into a conical form at its lower part. This part is perforated with holes to facilitate the escape of gases. This tube rises or falls so as to regulate the height of the charge in the receiver of the gas generator, which is supposed to be full of fuel. The shape of the interior of the gas generator is that of two cones with their bases opposite each other, attached together by a cylindrical part. This arrangement has the advantage, when employing rich coals which expand, of facilitating the descent of the charge into the upper part of the receiver in which the coal has not been converted into coke by the volatilization or the decomposition of the tarry substances.—Patent completed.

3716 J. E. Woolf, New Bond-street, W. Cooling milk.

position of the tarry substances.—Patent completed.

3716 J. E. Woolf, New Bond-street W. Cooling milk.
(A communication). Dated December 7, 1868.

This relates to the construction, arrangement, and combination of certain concentric, cylindrical, of otherwise suitably shaped vessels, each vessel being made with double walls or sides, affording spaces between the walls or sides for the circulation and passage of the cooler fluid. Through the bottom of the vessels, and fitted with watertight joints, are short pipes, having made in them openings communicating with the said spaces, so that the cooler fluid entering the bottom of the apparatus may be made to fill and pass through all the said spaces to the points of discharge at the top of the said vessels.—Patent abandoned. points of the abandoned.

3717 W. CHISWELL, Islington. Roughing horses. Dated

December 7, 1868.

The rough or roughs consist of a three cross fron bar or bar plate in two separate pieces, with shoulders to flinside the shoe, and flat at the ends, and so arranged, by means of a serew and nut, as to take a lever bearing on the shoe itself, and not in any way press upon the sole of the foot or feet each bar or cross plate is drilled to receive one or more sharpened steel pegs or roughs, threaded to serew into the bar at given distances, so that each three-crossbar or bar plate is furnished with three or more of the steel pegs, removable as may be needed from wear or otherwise, and replaced by others, or newly sharpened.—Patent abandoned.

3718 A. Hompray, Helesower, March 1998.

Patent abandoned.

3718 A. HOMPRAY, Halesowen. Manufacture of coke.
Dated December 7, 1868.

This has for its object, principally, to make coke from small cosl or slack, but may also be applied to the manufacture of coke from lumps of cosl. The inventor takes slack, or coal broken into slack, and consolidates the said slack into blocks by driving it little by little into moulds or rings of iron fireclay, or other strong material, or into a chamber of a furnace, the slack being, by preference, wetted with water during the consolidation process. The consolidation of the slack in the moulds or rings, or chamber, is effected by the percussive or stamping machinery hereinafter described. The moulds containing the consolidated blocks are heated in a furnace, and the coal is thereby converted into coke. He prefers to pile the moulds filled with consolidated slack upon one another, so as to prevent, as far as possible, the combustion of the coal during the coking process; or the blocks of consolidated coal may be coked without being protected by their moulds or rings.—Patent completed.

3719 J. Ridley, Belsize Park. Motice power. Dated

2719 J. RIDLEY, Belsize Park. Motive power. Dated December 7, 1868.

This consists in improved apparatus for obtaining motive power from wind for pumping or other purposes. The apparatus consists of a vane or blade combined with a pendulum and other parts in such manner that the face of the vane or blade is first presented to the wind to pro-

duce the movement of the vane in one direction, and the edge of the said vane is then presented to the wind, so that little or no resistance is offered to the return movement, which is effected by a pendulum or weight attached to or rigidly suspended from the vane.—Patent completed completed.

completed.

3720 A. KRUPP, Essen, Prussis. Breech-loading ordnance.
Dated December 7, 1868.

This consists in certain mechanical arrangements for more easily and effectually manipulating the wedge used for opening and closing the breech, and also for effectually locking such wedge in its position for firing, and at the same time accurately determining that the wedge is in its proper position in the gun. Also for igniting the charge in the gun by a vent through the centre of the wedge.

—Patent completed.

3721 E. Sinova, Shaffield, Moreobert, Pated Bosen.

3721 E. SIMONS, Sheffield. Horseshoes. Dated Decem-

This consists in a light steel or wrought-iron frame pro This consists in a light steel or wrought-iron frame pro-vided with a ball plate for covering in the hollow part of the hoof, and three or more "calks" or projections be-neath for giving a firm foot hold. A toe cap projects upwards in front over the toe of the hoof, and two heel clips are provided at the rear, the said heel clips being made of spring steel, and connected together by a screwed and slightly cranked bar, by turning which they can either be separated for placing the shoe on the hoof, and removing the same or closed in for fixing the shoe firmly when required.—Patent abandoned.

3722 W. R. LAKE, Chancery-lane. Photographing by artificial light. (A communication). Dated December 7,

1863.

The interior of the room or apartment is curved above and at the front and sides of the point whereon the light is to be concentrated, and a magnesium lamp or burner is arranged in such a position that its light will be reflected upon the said point. An opening is made in the curved end of the room for the camera, and a suitable background is placed at the other end. A lamp of any ordinary kind may be used for focussing.—Patent completed.

ary kind may be used for focussing.—Fatent completed.

3723 W. R. LAKE, Chancery-lane. Railway carriage wheels. (A communication). Dated December 7, 1868.

This wheel consists of the metallic shell provided with a deep rim, which forms the tread of the wheel, and a flange by which it is kept on the rail. There is an annular shoulder and a segmental clutch. Immediately within the rim is placed a rubber ring, the thickness of which is equal to the depth of the rim and shoulder. This ring is supported from the centre by the annular metallic shoulder encompassed by the ring.—Patent completed.

2724 C. F. C. CERTIN and I. WATSON Glasgow. Sup.

shoulder encompassed by the ring.—Patent completed.

3724 C. F.C. CERTIN and J. WATSON, Glasgow. Supplying air to dirers. Dated December 7. 1868.

This consists in drawing off or exhausting the foul air and gases, thereby allowing fresh air to flow down the fresh air, as heretofore practised. This is effected by means of a fan or exhauster, which may be driven by a system of wheelwork actuated by springs or by any other convenient method. The fan box or casing is connected to the tube or tubes, which communicate with the diver's helmet and lamp, through which the foul air and products of combustion are drawn off and discharged into the atmosphere, thus producing a partial vacuum within the helmet and lamp, which may be supplied with fresh air by means of one main air tube provided with two branches at one end, one of which is attached to the diver's helmet, and the other branch to the lamp.—Patent completed.

3725 T. RENNAN, Dublin. Latches or fastenings. Dated

and the other branch to the lamp.—Patent completed.

3725 T. RENNAN, Dublin. Latches or fastenings. Dated December 7, 1868.

It is proposed to secure the wires or wire ropes to the uprights or standards of strained wire fences by the aid of metal caps, rings, staples, or straps, fitted in some cases outside the standards, and in other cases, where hollow standards are employed, inside the standards. A hole or holes is or are made horizontally through the caps, rings, staples, or straps, so as to correspond to another hole or holes made transversely through the uprights or standards for the passage of the wire or wire ropes. After introducing the wire or wire rope, and straining the same in any suitable or well-known manner, it is gripped or held securely in its place in the upright or standard by the action of one or more wedges, which cause the cap, ring or strap to move slightly in or upon the standard, and thereby nip the wire between the opposite inner surfaces of the holes, made respectively in the standard and in the cup, or other like attachment.—Patent completed.

pleted.

3726 A. M. CLARK, Chancery-lane. Thread winders. Dated December 7, 1868.

This relates to an improved mode of winding silk, cotton, jute, and other threads, cord or twist, used for sewing and other purposes, or it may be fine wire, for the purpose of retailing the same. A flat card or plate of thin wool or metal is provided on each edge, with spaces or hollows corresponding with each other, so as to produce as many divisions as there are spaces in each edge. The winder is to be made of varying thickness and dimensions, and also with a greater or less number of divisions, so long as there are two or more. The winders may also have distinguishing colours, for indicating the size and quality of the silk or other threads are to be wound on the divisions of the winder in lengths, varying according to the size. The winding may be effected either by hand or machine.—Patent completed.

3727 C. FARRAR, Bow. Reducing wood to fibres. Dated

3727 C. FARRAR, Bow. Reducing wood to fibres. Dated ecember 8, 1868.

3727 C. FARRAR, Bow. Reducing wood to fibres. Dated December 8, 1868.

The inventor mounts upon a east-iron or other frame, in suitable guides, a reciprocating plane or cutting tool. In this plane there is fitted one or a pair of plane irons with adjustable screws or wedges, and with their cutting edges upwards and facing each other, when two are used. In advance of each plane iron is a metal box let into the body of the plane, and provided with a number of sharp pointed knives or lancets, which may also be adjustable and serve to score the wood longitudinally in front of the plane iron, thereby having the effect of reducing the shavings to narrow shreds or filaments. One or a pair of feeding hoppers is mounted upon the frame, and each hopper is provided on its opposite parallel sides with roughened, fluted or toothed feeding rollers, which are carried in suitable slots in the hopper, and are kept pressed inwards by springs, so as to nip the pieces of wood which are supplied edgewise into the hopper, and gradually feed or propel them downwards on to the plane as fast as the setting proceeds.—Patent completed.

3728 A. MACHIE, Warrington. Type composing appeared December 8, 1868.

3728 A. MACHIE, Warrington. Type composing apparatus. Dated December 8, 1863.

The type pockets are stationary, and are arranged in a circle, or a portion of a circle, around or over a revolving wheel or frame, the wheel carrying a number of pick-pockets, each of which is capable of withdrawing type from one of the pockets, the precise pocket upon which each pickpocket shall operate, being in one arrangement determined by the position of the perforations in a strip of paper, acting in concert with a system of levers and triggers or fingers in manner as or nearly as follows:—

The system of perforations which is found suitable is similar to that employed in former and hereinbefore mentioned apparatus, in which each letter or sign is represented by two or more perforations, the distinctions between the several letters or signs being effected by changing the positions of the perforations from one to another of a series of straight lines, or imaginary lines, as, for example, fourteen, which number will in ordinary cases be found to be sufficient. The strip of paper thus perforated drum or plate and into contact with a series of fourteen pins, attached to or formed on a corresponding number of levers or triggers, each movement of the paper bringing two perforations opposite to two of the pins, which said two pins enter the said perforations, and the corresponding levers move into position to set one of the pickpockets.—Patent completed.

3729 H. A. BONNEVILLE, Paris. Spinning looms. Dated December 1, 1962.

3729 H. A. BONNEVILLE, Paris. Spinning looms. Dated December 8, 1868.

December 8, 1868.

This consists in a pressure piece oscillating on a pivot, which slides in a slide at the extremity of a support, fixed to the bar of the loom, this oscillation being obtained by means of a connecting or drawing rod, of which one extremity is fixed to the said pressure piece, whilst the other extremity is connected with the lever of a steelyard, the movable counterweight of which allows of increasing or diminishing the pressure exerted by the pressure piece on the rollers.—Patent abandoned.

3730 W. J. THICKENEE, Islington. Watches. Dated De-ember 8, 1863.

on the rollers.—Patent abandoned.

3730 W. J. THICKENER, Islington. Watches. Dated December 8, 1868.

This consists in introducing into the impulse lever a gold stud or screw, slotted through to receive the jewel, the points of which are curved elliptically for taking into the notch of the roller, and giving the vibratory impulse to the balance, by which arrangement greater mathematical accuracy of adjustment and perfect solidity of the working parts is maintained than by the system at present in use. In connection with the above the escapement wheel is formed with the points and stems of the teeth cut at obtuse and acute angles upon the periphery of the wheel, so as to form locking teeth, at the same time obviating banking pins, and thereby giving a double impulse action to the balance, and, in the event of the watch meeting with any jar or sudden shake, the ruby pallet or pin in the roller (on striking the points of the levery unlocks the pallets, which, on being liberated, run down the angles of the teeth of the escapement wheel and break the force of the concussion by failing softly and propolling the pin forward, whilst the main impulse power is still on, by the result of which the vibrations of the lever are brought sooner to an equilibrium without causing any disturbance or disarrangement in the time of the watch by external motion, or otherwise, the said escapement wheel being formed of gold, and the lever and roller of tempered steel, provided with ruby pallets, obviates the necessity of employing lubricating oil; and, second, the introduction of an impreved locking detent into marine and other chronometers for compensating for any interruption or stoppage to the escapement, by which uniformity of time is effectually secured; and, third, in the construction and employment of a bi-coniform spiral timing spring, for producina concentrical vibratory action and steady oscillation of the balance.—Patent completed.

### APPLICATIONS FOR LETTERS PATENT.

Dated June 15, 1869.

1825 P. Jensen, Chiswell-street, Finsbury-square, Middlesex. Improvements in the manufacture of glass, 1826 A. W. Moss, Nelson-square, Surrey. Improvements in brims or sunshades for attaching to hats or caps. 1827 F. Lejeune, Brownlow-street, Drury-lane, Middlesex. Improvements in weighing machines.

1828 M. Benson, Southampton-buildings, Chancery-lane. Improvements in mentising machines for making mortises in all kinds of wood and joirery.

1830 M. Benson, Southampton-buildings, Chancery-lane. Improvements in band-sawing machiners for making mortises in all kinds of wood and joirery.

1830 M. Benson, Southampton-buildings, Chancery-lane. Improvements in band-sawing machinery for sawing wood, iron, or other material.

1831 F. C. Bakewell, Haverstock-terrace, Hampstead, Middlesex. Improvements in machinery and apparatus for letter-printing.

1832 W. Smith, Bathgate, Linlithgowshire. Improvements in treating or purifying mineral oils.

1833 J. Bastow, Shepherd's Bush, Middlesex. Improvements in bleaching yarns, threads, and woven fabrics, 1834 J. Lindley, Clifton, Lancashire. Improved apparatus for oiling the axies of trucks or waggons used in collieries, and for other similar purposes.

1836 W. Yates, Manchester. Improvements in furnaces for effecting theiconsumption of smoke.

1837 W. Bottomley, Bradford, Yorkshire. Improvements in footsteps, steps, or bearings for the spindles and shafts of various machinery.

1838 R. Beecrott, Ovenden, near Halifax. Improvements in planchinery for combing wool or other fibrous substances.

J. Halliwell, Halifax. Improvements in hold-

9 J. Halliweit, and it for carriages.

10 J. T. Mabson, Rue Ste, Appoline, Paris. Improves in apparatus for carrying invalid, wounded, sick, ther persons. ments in apparatus for carrying and other persons.

1841 T. Knowles, Manchester. Improvements in doubling

1841 T. Knowles, Manchester. Improvements in doubling frames.

1842 H. Tylor, Queen-street, City. Improvements in the construction of spring mattresses and in bedsteads.

1843 C. Stuart, Manchester. Improvements in chain pulley blocks.



1844 R. M'Hardy, Edinburgh. An improved agricultural and garden implement.
1845 D. Dishart, Glasgow. Improvements in sewing machines.
1846 J. Tangye, Birmingham. Improvements in governors or regulators for steam engines or other motive power engines.

power engines.

1847 B. Wartski, Swan-street, Bethnal Green, Middle-Improvements in the manufacture of waterproof

sex. Improvements in the manufacture of waterproof overcoats and other garments.

1848 S. V. Fontana, Copthall-court, Middlesex. Improvements in harmoniums.

1849 W. R. Lake, Southampton-buildings, Chancerylane. An improved mode of, and machinery for, producing a polished or enamelled surface upon sheet iron.

Dated June 16, 1869.

1850 G. W. Fox, Manchester. Improvements in the treatment of castor, cod-liver, and other medicinal oils, in order to render the same more palatable.

1851 R. Hornsby and J. E. Phillips, Spittlegate Iron Works, Grantham, Lincolnshire. Improvements in reaping and mowing machines, and in apparatus for sharpening the knives of such machines.

1852 R. Hornsby and J. E. Phillips, Spittlegate Iron Works, Grantham, Lincolnshire. Improvements in hay making and raking machines.

making and raking machines.

1853 W. Woofe, Derby-street, Bedford. Improvements in the construction of ploughs.

1854 E. Cardon, Rue Ste. Appoline, Paris. Improvements in the construction of the provents in which we have been supported by the provents in which we have been supported by the provents in which we have been supported by the provents in which we have a provent in which we have a prove

1834 E. Cardon, Rue Ste. Appoline, Paris. Improve-ments in ships. 1855 T. Routledge, Ford Works, near Sunderland. Im-provements in the preparation of materials for the manu-facture of paper. 1856 A. Destouy, Southampton-buildings, Middlesex. Improvements in means or apparatus for sewing boots

and shoes.

1857 W. E. Newton, Chancery-lane. Improved apparatus for cleansing and preparing rags for the manufac-

ture of paper.

1858 B. Hunt, Serle-street, Lincoln's Inn. An improved apparatus for ventilating and purifying rooms or apart-

ments.

1859 C. Marlor, Denton. Lancashire. An improved pad
for hats, caps, and other coverings for the head.

1860 W. R. Lake, Southampton-buildings, Chancery,
lane. A new method of, and apparatus for, counting the
stitches made by a sewing machine.

1861 J. Kirk, S. Shelmerdine, and C. Froggatt, Stockport, Chester. Improvements in the machinery used for
felting or planking the bodies of hats or bonnets.

1862 J. H. Banks, Brook-street, Knutsford, Chester.
Improvements in convertible desks or benches such as
are used for schools, churches, and other similar pur-

used for schools, churches, and other similar pur-

Dated June 17, 1869.

1863 J. Harding, Warrington, Lancashire. Improvements in mail or cash and other bags or portable receptacles, and in fastenings to be used for the same, and appliances for the working thereof.

1864 W. M'Nabb, Cambridge-terrace, London-road, Clapton, Middlesex. Improvements in fasteners for bands, and the modes or methods of applying the same.

1865 J. H. Johnson, Lincoln's Inn-fields. Improvements in picks, which improvements are also applicable to axes, adzes, rakes, hoes, shovels, and other like instruments. ments

J. H. Johnson, Lincoln's Inn-fields. Improve-1866

1866 J. H. Johnson, Lincoln's Inn-fields. Improvements in the manufacture of sugar.

1867 C. and E. Brightman, Bristol. Improvements in the manufacture of shoes and boots.

1868 W. R. Lake, Southampton-buildings, Chancerylane. An improved process for obtaining sulphates, and obtaining fine silver therefrom.

1869 W. B. Lake, Southampton-buildings, Chancerylane. An improved culinary utensil to be used on stoves or ranges, for broiling, toasting, baking, and other analogous purposes.

gous purposes, 1870 S. Adams, Saltley, near Birmingham. Certain improvements in velocipedes for one or more persons, which said improvements are also applicable for other useful purposes.

Dated June 18, 1869.

1871 T. Bourne, Birmingham. Improvements in veloci-

1871 T. Bourne, Birmingham. Improvements in velocipedes.

1872 J. G. Tongue, Southampton-buildings, Chancerylane. The production of novel and ornamental effects in the manufacture of various articles of glass applicable to various ornamental and other objects, and to lamp shades, globes, reflectors, or other transparent or semi-transparent articles made of glass, and in means or apparatus employed for the above purpose.

1873 I. Gregory, Victoria Park, Manchester, and E. Ainsworth, Clayton Bridge, Newton Heath, Lancashire. An improved 'drag motion applied to throstle frames and doubling frames used for spinning and doubling cotton and other fibrous substances.

1874 H. and F. C. Cockey, Frome Selwood, Somersetshire. Economizing the consumption of fuel used for steam boilers and lessening the quantity of smoke.

1875 J. Napler, Glasgow. Improvements in the construction of cooking ranges, stoves, and grates.

1876 G. Molland, Southampton. Improvements in axleboxes for the wheels of carriages.

1877 W. Topham, jun., and S. Wells, jun., Birmingham. Improvements in the manufacture of the handles of kettles and other vessels and articles.

1878 M. Andrew, Edgbaston, Warwickshire. Improvements in locks and latches.

1879 W. R. Lake, Southampton-buildings, Chancerylane. Improvements in the permanent way of railways.

1880 E. Haas and V. Wanostrocht, Walbrook, City. Improvements in pushing jacks or apparatus to facilitate moving railway carriages.

Improvements in pushing jacks or apparatus to facilitate moving railway carriages.

Dated June 19, 1869. 1881 T. Silver, Southampton-buildings, Middlesex. An mproved device for holding letters, bills, and other

papers. 1882 J. Bullough, Accrington, Lancashire, and C. Cat-low, Burnley, Lancashire. Improvements in looms for

low, Burnley, Lancashire. Improvements in binocular and stereo-hithe, Surrey. Improvements in binocular and stereo-1833 S. Holmes, Brunswick-terrace, Lower-road, Rother-hithe, Surrey. Improvements in binocular and stereo-scopic microscopes. 1834 H. A. Bonneville, Sackville-street, Piccadilly. Com-pounding and applying certain compounds to render fabrics water repellent. 1835 A. S. Harington, St. James's Club, Piccadilly. An improved pouch for tobacco and other articles used by smokers.

1886 H. Bauerrichter, Allen-street, Clerkenwell, Middle-sex. Certain improvements in the construction of show-cases and fancy boxes. 1887 C. E. Brooman, Fleet-street, City, patent agent. Improvements in apparatus for ascertaining weights and

strains. 1888 J. B. Brooks and G. Picken, Birmingham. 1089 J. D. Brooks and G. Picken, Birmingham. Improvements in the sticks of umbrellas and in walking sticks and whips.

1889 F. Forder and J. Traves, Bilston-street, Wolverhampton. Improvements in velocipedes.

1890 E. H. C. Monekton, Oriental Bank Corporation, Threadneedle-street. Improvements in the manufacture of iron and steel.

1 Inreadneed street. Improvements in the manufacture of iron and steel.

1891 S. Nicholls, Plymouth. Improvements in machinery for tilling or cultivating land, also applicable for

draining purposes.

1892 R. Olpherts, Ardee House, Ardee, Louth, Ireland.
Improvements in indigo presses, and in cloths to be used

Dated June 21, 1869.

1893 M. Olsson, Richmond-road, Barnsbury, Middlesex.
Improvements in preserving animal and vegetable sub-

Improvements in preserving animal and vegetable substances.

1894 W. Pidding, Walcot-square, Lambeth, Surrey. Improvements in mechanism applicable to locomotion.

1895 A. J. Glas, Bedford-street, Westminster. A new mode of, and apparatus for, decorticating, separating the germ, and drying wheat or other grain.

1896 B. Bell, Park Village East, Regent's Park. Improvements in the mode of applying or affixing wood and metal sheathing to iron, steel, or wooden ships and other floating structures, and also in such sheathing.

1897 A. Manbre, Baker-street, Portman-square, Middlesex. Improvements in preparing and treating cereal and other vegetable substances, extracting the starch they contain, and in converting it into fermentable saccharine matter for use in brewing and distilling, in making vinegar, cyder, perry, and other fermented drinks, and also for sweetening and preserving food, syrups, confectionary, and other useful purposes.

1898 P. G. B. Westmacott, Newcastle-upon-Tyne. Improvements in hydraulic or steam cranes or other similar hoisting or hauling machinery.

1899 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in blowing and pumping engines, parts of which improvements are applicable to other direct-acting steam engines.

1900 W. R. Lake, Southampton-buildings, Chancery-lane. Improvements in carriage wheels.

1901 T. F. Cashin and J. Green, Gresham House, Old Broad-street, City. Improvements in furnaces.

Broad-street, City. Improvements in furnace

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the "London Gazette," June 22, 1869. From the "London G 389 H. J. Richman 390 F. Jenkin 400 G. Critchley and H. B. Fox 410 J. Stuart 414 C. T. E. Lascelles 415 J. F. Bentley 418 G. Broadhurst and J. Kershaw 426 G. F. Ansell 427 P. J., F. W., and H. G. Smith, and A. Pappenberger 428 G. A. Nowell 432 B. P. Stockman 434 H. Edwards 697 J. A. Jaques, J. T.
Oakley, and J. A.
Fanshawe
728 T. Obach
737 F. O. Palmer
767 J. Cooke
781 J. and W. ThomlinSon 800 J. Ramsbottom
836 J. Thomas, W. Bacon, and Groves
849 J. D. Morrison
914 C. Marsden
1014 G. F. Griffin
1021 W. Johnson
1036 A. Helwig
1045 R. Norfolk
1077 W. A. Hunter
1097 W. Ashton and J. H
Storey
1167 J. Vivian
1202 L. Goetz
1343 J. Wilson
1360 F. W. Kaselowsky
1363 E. and E. Thomas
and J. Morris
1466 H. Luke
1484 M. Wolfsky
1494 F. E. Saxby and I.
M. M'George
1551 J. Langham
1554 A. J. Dudgeon
1572 W. H. Dupre
1574 J. Platt
1583 R. Orley
1591 L. J. Crossley and R.
Hanson
1612 M. Benson 820 J. Ramsbottom 428 G. A. Nowell
432 B. P. Stockman
434 H. Edwards
437 F. J. Vandenvinne
438 W. H. Hayhurst
440 T. V. Trew
441 G. H. Morgan
445 W. Summers
446 C. Gordon
448 J. Holmes
458 W. R. Lake
464 T. Bond
465 T. Winder
467 T. Billyeald
469 L. N. Legras
470 V. A. Houdaille
476 J. Fletcher
477 F. Walton
483 J. Atkins
493 A. Bartholomew
494 A. Munro and W. B.
Adamson
505 M. Vary
506 F. Delbreil
508 W. M. Cochrane
520 J. Barton
528 A. Jacob
530 H. W. W. bitshead

520 J. Jacob
 528 A. Jacob
 530 H. W. Whitehead
 535 F. G. Fleury
 539 J. and W. Weems
 540 W. Ibotson, W. W.
 Ladelle and A. G.

Davis

634 J. Farrington 692 C. Mather and W. Rossetter

1669 J. Sturgeon 1694 J. A. Bindley 1715 J. Lloyd 1721 J. H. Johnson 1730 G. W. Ley 1741 K. Cook and G. Hauxwell 1777 J. Mabson 1795 J. Foster and J. Hol-linake Ladelle and A. G.
Southby
S. Osborn
J. O. C. Phillips
J. Neilson and J.
Marshall
W. Thomas and W. linrake 1797 W. R. Lake 1800 G. W. Oliver 1824 D. Fitzgerald

1591 L. J. Cros Hanson Rensc

1622 J. Cranston 1660 J. Sturge

1612 M. Benson 1614 H. D. M'Master and A. Dale

Rossetter | 1824 D. Fitzgerald

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list, who have given notice of their intention to proceed, within twenty-one days from the date of the "Gazette" in which the notice appears, by leaving at the Commissioners' office, particulars in writing of the objection to the application.

# PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1790 J. and T. A. Nield 1799 J. Warren 1799 J. Warren 1812 J. B. Wood

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PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID

1628 B. F. Stevens 1644 F. B. Lucas 1646 F. J. Bolton 1666 J. Parker 1657 J. Moller 1670 T. Whitby 1672 W. and W. T. Eades 1674 A. V. Newton 1722 W. E. Gedge 1738 R. Hornsby 1902 J. Saunders and J. Piper

#### LIST OF SEALED PATENTS. Sealed June 18, 1869.

Sealed Jun

8876 W. R. Lake

8878 W. F. Stanley

8884 J. S. Walker

8885 L. A. W. Lund and

E. Axmann

8887 R. Whitaker

8889 J. Wilkinson

8889 W. E. Gedge

8894 P. G. Jarre

8894 P. G. Jarre

9904 J. Palmer

910 J. Snape

3914 J. G. Jennings 18, 1869.

3916 W. E. Gedge
3922 G. Lowry
3925 W. E. Gedge
3926 F. P. Warren
2933 W. R. Lake
3936 R. Boby
3977 C. de Bergue
576 G. Rees
600 J. Townsend
749 J. Bathgate
905 J. J. Bodmer
1310 H. A. Bonne vi 1310 H. A. Bonne ville

Sealed June 22, 1869. 61 A. B. Brown 90 B. Hurt 359 W. Adams and W G. Beattie 3920 W. G. Revee 3921 G. Hookham 3930 W. H. Walenn 3931 T. Warren 3935 H. Robinson and J. G. Beattie 484 E. Round 487 A. Ransome 594 T. Moore 791 J. G. Jennings 873 J. E. Emerson 875 A. Clark 920 A. C. Kirk 1211 H. Lee Smith 3938 H. Clifford 3959 G. T. Bousfield 3974 E. T. Noualhier 3980 W. R. Lake 3988 R. Griffiths 25 S. Bateman

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#### OF SPECIFICATIONS PUBLISHED LIST

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